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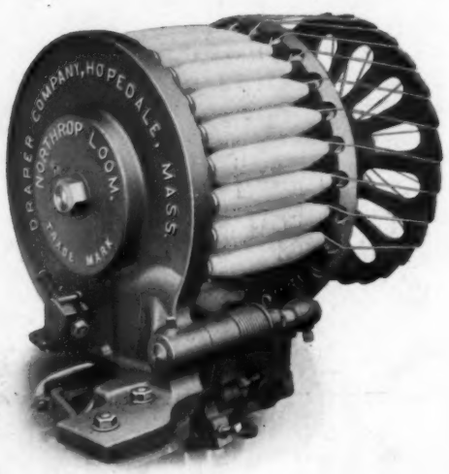

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HANDLING AND MARKETING COTTON.

Under this heading we are publishing elsewhere in this issue some extracts from a recent report issued by the Office of Markets, United States Department of Agriculture. The facts set forth are to the point and indirectly indicate where the high cotton prices to the spinner originate, as well as the indefensible system of baling and storing which is at present in force.

The suggestions for cooperation among growers do not, in our opinion, go far enough. Not only should the growers cooperate, but they should establish incorporated companies similar to that of the Yazoo & Mississippi Valley Cotton Company, which was formed by a number of the Mississippi cotton planters in 1911. Then locate gin compresses at central points, and sample and compress their cotton in neat, compact, well-covered bales that will find a ready market among spinners at the market price for the staple and grade indicated by the sample.

A gin compress will handle the output of a battery of four to six gins. It turns out a bale of 500 pounds, 20 by 26 by 54 inches, or 18 by 30 by 48 inches, compressed to a density of 30 pounds to the cubic foot. The clean, closely-woven burlap and the seven steel ties used in covering one of these bales gives an average tare of 12 pounds per bale, as compared with the established tare of 24 pounds, for which the cotton manufacturers are forced to pay cotton prices at the present time.

Several important advantages over the old method of recompression recommend compression at the ginnery. These are greater density and uniformity of package, character of wrapping, ease and economy of transportation, and minimum of tare. The burlap covering of these bales completely protect the cotton and permit the package to be plainly marked. However, the greatest advantage of this system, from the growers standpoint, would be the substitution of an entirely new system of sampling and grading which will limit the pulling of one sample from each bale before the cotton is covered, this sample to be placed in a suitable receptacle bearing duplicate marks with the bale from which it was drawn, and with the final price to the grower to be based on the sample.

While it has been claimed that this system is not entirely practicable, it is worthy of careful study and trial, and if the incorporated organizations disposing of the bale will vouch for the similarity of bale and sample, there seems to be little chance for difficulties arising from this quarter.

The Federal authorities are doing good work toward the establishing of this and similar reforms in the handling of the South's great money crop. A law requiring the sale of cotton on the net weight basis should be included, however, as the present method is another wasteful feature of the old-time system, which has been handed down from gen-

eration to generation, until now the cotton spinner is expected to pay cotton prices for 24 pounds of "junk" as one of the perquisites accruing to the cotton seller. In all of these much-needed reforms the growers and the Department of Agriculture will be certain of the active cooperation of the cotton manufacturers, who also feel that their interests are not being fairly considered in this question of the handling and marketing of cotton.

EVERY TUB ON ITS OWN BOTTOM.

It goes without saying that a manufacturer in the cotton business or any other line has a right to be satisfied if the net results of his operations are comfortable dividends to the stockholders, a surplus in the bank and general prosperity. A result of this kind needs no defense, and means that success has been accomplished. In the beginning, therefore, let it be understood that the mill which is making money at present need not worry about the question of system.

It happens, however, that present day manufacturing is on such a generally high level as to efficiency, and has been put on such a marked competitive basis, that it would be next to impossible to make the sort of success indicated above without using every aid which comes legitimately to hand. The mill which can operate without taking pains to weed out carelessness, looseness and inefficiency, wherever it may be found, and still show up at the end of the year with a satisfactory profit on its investment, is certainly the exception and not the rule.

Noblesse oblige; and this applies to the manufacturer. It also applies to those in charge of the various operations in the mill. From this standpoint, position brings responsibility, and knowledge and appreciation of the responsibility bring efficiency in the highest possible degree. The man who "has his work cut out for him," to use a colloquialism, is more likely to do that work, and do it well, than he who has only a vague and general idea of what is being required.

The principle of having every tub stand on its own bottom in cotton manufacturing is, therefore, a good one. Every department head, every overseer, every foreman, ought to know just what he must accomplish in order to be considered a satisfactory employee. Instead of merely working along in a more or less mechanical sort of way, a definite goal will be aimed at, and the effort is certain to produce more satisfactory results.

The only way in which it is possible to make every man in charge of production work realize his responsibility is to keep a careful and constant check on his operations. In other words, each department should be conducted as though it were a separate institution, and its output passed on to the next with the proper costs figured, so that if there are any leaks or excess expenses at any point along the line, it will be possible to locate them.

The importance of this is easy to realize when it is remembered that in mills where this is not done everybody may be cognizant of the fact that the manufacturing cost is excessive, without being able to put his finger on the weak spot. The weakness is there, because the results prove it; yet unless each department is checked up and results compared, it will not be possible to say just where the fault lies. The responsibility cannot be placed until the defects are located.

In a mill which carries on as many different operations as the average Southern plant does, including carding, spinning, weaving and finishing, it is possible to lose money at any or all of these processes unless the manufacturer is watching the situation closely and figuring the results in each department. He ought to know how much it costs him to deliver the carded material to the spinning department; how much his yarns cost; how much it costs to weave the goods; and, finally, what the finishing expenses are.

If he does not know this, he is, like the boy at school, able to find "the answer in the back of the book;" he knows the result, but he does not know how it has been achieved. The proposition which confronts the youthful student and the cotton manufacturer is that of analysis. By working out the problem step by step to the final result, both are able to see where mistakes, if any, are being committed.

The difficulty of checking up is, of course, obvious. The distribution of power expenses, for example, is difficult. Even with the exact power required for each machine known, how is it possible to say what the cost of steam used in the dye-house is? Some of it is exhaust and some live steam, and determining the cost is a difficult proposition. But such intricate questions can be disposed of fairly satisfactorily by averaging the expense and apportioning it among the various departments as exactly as experience and study of the power requirements of the equipment may suggest.

Labor cost can be determined with absolute exactness; and as this is one of the main items of manufacturing expense, it is important that this feature be given proper attention, because the department which is using more labor than is actually needed to turn out the goods is causing the manufacturer to spend money unnecessarily. The cost of labor is not a final indication of the production expense, however, inasmuch as the condition of the machinery affects the production, both as to quality and quantity. However, poor labor and good machinery, and good labor and inefficient machines, will both show a high manufacturing cost, and this fact should suggest closer inspection of the situation, with a view to determining which end of the proposition is at fault.

Putting each department on an independent basis produces the kind of friendly competition which is the life of many manufacturing plants. Under the conditions which exist in many mills, it is too easy to blame the other fellow. The weaver can put it up to the spinning department, while the foreman of the spinning room may say that excessive costs are due to the roving being in poor shape and the card room not turning out either as much or as good material as it should. Without the ability to scrutinize the actual figures and compare notes, the manufacturer and his superintendent cannot demonstrate where the fault lies.

On the other hand, however, if each foreman knows that his work is not only being supervised in a general way, but is being checked as to cost, so that his showing will be determined solely by his own efforts, without being clouded by what happens to the material, either before he gets it or after it leaves his department, there is every incentive for him to endeavor to make a good showing. He is naturally stimulated to the task of reducing costs by increasing quantity or improving quality, realizing that what he does he will get credit for.

This is really one of the discouraging features of having such a position in a plant where the records are not

sufficiently analytical to show what each department is doing. Good work may be concealed by poor work further along the line; and inefficient methods in one department may overcome entirely the excellent service being rendered in another. The man who is ambitious and anxious to prove his worth will welcome having a system which will show exactly what his department is doing, and the manufacturer, of course, wants no other kind in charge of his business.

Such a plan as that suggested may involve the use of a cost accounting system, which has not been thought worth while up to this time. But while the results, considered solely from a cost accounting angle, may not be regarded as worth the expenditure, the value of the information thus secured, from the standpoint of mill operation, is bound to be useful. It could probably be demonstrated that the man who does not know his costs as to each department might find his ultimate costs greater than they should be and not know the reason why; but aside from this, analyzing operations so as to show the expense of production in each department is certain to improve the character of the work being turned out, and will be worth while judged solely from the results along that line.

The investment in clerk hire, made necessary by the compilation of figures from each department, may seem too large at first to be worth while, but while knowledge of every kind is costly, it is no less true that knowledge is power. Surface knowledge, which is not backed by the detailed and thoroughgoing information which alone reveals the secrets of manufacturing success or failure, is dangerous; and if the plan of systematizing cost systems and accounting methods so as to show what each section of the plant is doing merely confirms what the general figures have already indicated, it will be worth while, considered solely as "efficiency insurance."

HENRY FORD AND THE LABOR PROBLEM.

No solution of the labor problem is involved in the profit-sharing plan instituted in his factory by the autobile manufacturer, Henry Ford. What Mr. Ford has done is to make use of an opportunity to enhance the material prosperity of his own employees, but such an opportunity is not within the grasp of all employers, or even of any considerable number of them. He has instituted a policy which ought to benefit him as much as his workmen. In fact, if it does not do so it will have no value as a social experiment. It is only insofar as it will encourage other manufacturers to deal more generously with their employees that it can prove useful as a means of bettering the condition of anyone outside of his factory. In order to encourage others to follow his example, his plan must prove to be a means of producing profits as well as a means of sharing them. But not many employers will be encouraged to do likewise, and there is a good reason why they won't.

Mr. Ford is acting in accordance with advice seldom given to employers, but very frequently volunteered to employees. This advice is that to voluntarily give more and better service than his duty actually requires. "Don't watch the clock," employees are told; "start to work a little ahead of your regular time, and stay a little after the whistle blows to quit work. Your employer will show his appreciation." The flaw in that advice is that following it can benefit an employee only so long as such conduct will be exceptional. If all followed it, none would have any advantage. Mr. Ford realizes that it benefits an employer just as much to have the good will of his employees as vice versa. In adopting what must appear to many other employers as an extreme measure, he surely ought to obtain such good will, and that ought to show results in improvement in quantity and quality of output per man. This has been the result with other manufacturers who have been broad-minded enough to realize that the good will of employees is a valuable asset well worth cultivating.

Tom L. Johnson knew this. In his steel rail mill at Johnstown, Pa., he paid more than the market rate for labor. He found this brought to him the best quality of labor, leaving the inferior grades to his neighbor. "Golden Rule" Jones had the same experience in Toledo, as also have Fels & Co. in Philadelphia. But if all employers were to do the same thing, this advantage would be lost. So unless an employer has a monopoly or has succeeded in making his trademark a valuable aid to the sale of his product, he will probably not see his way clear to imitating Mr. Ford.

Even if all employers could and would do as Mr. Ford has done, existing economic conditions would soon deprive the employees of all financial benefits. It would finally cause, as do all improvements, an increase in land values sufficiently great to enable land owners to appropriate in increased rents all the financial benefits. Not until land values are taken for public use can either employer or employee derive permanent benefits from any public improvement. Ford's plan, to benefit anyone at all under existing conditions, must remain restricted to a small circle of industries. To become a benefactor in a broad sense a man with the good impulses of Mr. Ford must cooperate with those who are endeavoring to have land values appropriated for public use, by which means only can an application of golden rule principles prove a general benefit.

STRIKING CHANGES IN AMERICAN TRADE.

During the last third of a century factory products have been steadily supplanting the products of the farm in the export trade of the United States. In 1880 agricultural products formed 84.3 per cent of the exports and manufactures (exclusive of foodstuffs) only 14.78 per cent. In 1913 the proportion of manufactures in the export trade had increased to 48.8 per cent, while that of agricultural products had dropped to 46.1 per cent. With the increase in exports of manufactures there has been a steady increase in the imports of raw materials for use in manufacturing.

These and other significant changes in our trade are analyzed in an interesting manner in the "Annual Review of the Foreign Commerce of the United States," a bulletin just issued by the Bureau of Foreign and Domestic Commerce.

The publication also contains a set of charts which graphically show the heavy increase in the American export trade in several leading manufactures. Copies of the bulletin (Miscellaneous Series No. 14) may be obtained upon application to the Bureau.

TEXTILE COST ACCOUNTING

An Outline of its Purposes and its Application—It Renders a Most Valuable Service from the Standpoint of the Manufacturer—Every "Tub" Should Stand On Its Own Bottom.

BY C. B. ANNETT AND C. F. CUNNINGHAM.

Cost accounting, as the name implies, is the application of the science of accounting to the determination of costs. Its fundamental principles are applicable to all lines of industry. It is really only a detail of the large question of organization, and it is therefore evident that this detail cannot be solved independently. There must be:

a "A clear definition of the departments of the business so that similar work and similar functions shall be grouped in one department.

b "A positive definition of duties of each department and its relation to the general business.

c "A clear fixing of the responsibility and a willingness to have responsibility rest with the heads of the various departments.

d "Scrupulous care to communicate the various wishes of the chief executive through the proper channels, that the responsibilities fixed may be preserved and each department limited to its particular functions.

e "The harmonizing of the commercial accounts, that is, the representative accounts of the business with the general scheme which is to be followed in the factory accounting or cost-keeping department.

f "A proper head to the department of cost-keeping who must be as much an engineer as an accountant, and capable not merely of compiling figures, but of using the information when the facts are compiled; for the end of cost-keeping is cost reduction. This man must be so efficient that he may be depended upon by the highest official of the company and he will naturally be high in the counsels of the latter. A man who fills such a position will have no sinecure."[2]

It is perfectly obvious that costs which are inaccurate, are not worthy of consideration and in fact are worse than none at all, as they are often entirely misleading. It therefore seems desirable before entering upon a discussion of specific methods of obtaining costs, to discuss briefly the fundamentals essential to all cost accounting.

The first essential is that cost should be a statement of fact, all assumptions, in so far as possible, being eliminated. In contradistinction, an estimate, or estimated cost, may not agree with the real cost because of the very fact that it takes into consideration probable changes of conditions.

The lack of a clear understanding of the difference between a cost and an estimate, has frequently led to much confusion and the distinction between the two cannot be too clearly defined. Many manufacturers seem to fall into the habit of allowing themselves to believe that cost is what they wish it to be, rather than a statement of the real facts, and this almost invariably leads to disaster.

To make this important point clear, consider that an order for a fabric has been received, conditioned on a certain price. The records show that this fabric was previously made at a certain cost. It obviously would not do to accept the order without taking into consideration all changes in conditions that have taken place since the former production. Wages may have increased, automatic looms may have replaced plain looms, the price of raw material may have been advanced, and a number of the elements of cost may have changed, which would alter the previous cost. Consequently an estimate is made, based on the known facts taking these changes into consideration as accurately as possible. The order is accepted because the estimate indicates that, provided the conditions considered therein hold true, a profit should result from the sale. During the actual manufacture of the order, however, alterations of conditions occur which were not anticipated in the estimate. The production decreased, the shrinkage increased, the percentage of second quality goods increased; perhaps a number of such cost factors varied. In consequence the anticipated profit becomes doubtful and it is, therefore, evident that the estimate cannot be used as a guarantee of profit. After the fabric is completed, the cost is carefully compiled and the true cost, regardless of the existing conditions, determined. This affords a proof of the accuracy or inaccuracy of the preliminary estimate, determines whether or not the order has been profitable and becomes a basis for estimating more accurately on future orders.

The second essential is predicated upon the first, that if cost is to be a statement of fact, it must be subject to proof. In order to insure this, it is essential that the person responsible for its compilation have full access to the most private information of the company's affairs and the unqualified confidence of its officers in order that every item of expense be included. Further, the accounting methods should be so arranged that the results obtained are carried to, and incorporated in, the commercial (private) books of the company.

The third essential is that the several departments involved work in complete harmony. All persons having to do with the recording and tabulating of statistics must work together for the single purpose of reporting information not alone accurately, but also promptly, in order that the data so recorded may be available before they become history. The sources of much of the information essential to cost must, of necessity, be from persons in the mill and it is especially necessary that they be impressed with the importance of the information they are recording.

The control of all materials not in process should be under the direction of a general storekeeper, and the control of production under a production manager.

It should be the function of the production manager to control production from the raw material to the finished product. Changes in production methods should be made

(Presented Before American Society of Mechanical Engineers.)

[2] James Newton Gunn, "Engineering Magazine," January, 1901.

only through the production manager and it should be his duty to at all times keep the cost department fully informed as to the methods in force and the quantities produced.

Total cost may be divided into three main parts or divisions: (*a*) manufacturing or mill cost; (*b*) selling cost; (*c*) administrative cost. The latter two are generally known as commercial expense and are distinct from manufacturing or mill cost. They are usually combined and added to the manufacturing cost on a single percentage basis. While this is reasonably correct in a great many cases, it should be avoided wherever it is possible to obtain a more equitable basis. Many manufacturers dispose of their product through a selling agency or commission house, and therefore know exactly the selling expense chargeable to each fabric and should accordingly, apply this selling expense directly to the product.

Manufacturing cost is the sum of the following: (*a*) direct material cost; (*b*) direct labor cost; (*c*) indirect cost or burden.

Direct material cost includes the cost of all material entering into the product and directly assignable to it, and direct labor cost the wages paid which are directly chargeable to the product.

Indirect cost or burden includes the cost of labor and material and miscellaneous expenses not directly chargeable to the product, such as superintendence, power, heat, light, depreciation, etc. Speaking generally it includes all items not included in direct labor or materials.

Each of the above may be subdivided, if desired. The indirect cost, particularly, is a complex item and can be treated more readily if segregated, for instance, into (1) power, heat and light; (2) departmental expenses; (3) general expense.

The cost of power, heat and light includes all expenditures incident to the production and distribution of power, heat or light. It is desirable to distribute the cost of power, heat and light by actual consumption. Obviously more power is required to operate a heavy 72-in. loom than a light 28-in. one. A department using steam for manufacturing and heating should be charged proportionately more for steam than a department using it only for heating. The proper percentage may be obtained by actual measurement or it may be approximated from tests. While the former method is preferable, the latter is sufficiently exact if proper facilities are had for making accurate tests.

Departmental expense includes all items of expense which can be charged directly to a department, for instance, departmental supplies, foreman's wages, fixers' wages, etc. It can be apportioned to the product by one of a number of methods.

General expense includes all items of expense which are not directly chargeable to a department, and which therefore must be apportioned to the departments on a more or less arbitrary basis.

There are two general methods of collecting cost data: (*a*) by definite lots or orders; and (*b*) by operations. As the name implies, the first method provides for the determination of the cost of the definite quantities of product and is applicable only to cases where the material can be processed in definite lots and kept intact through the several operations. These requirements render this method impracticable in such textile mills as largely manufacture what are known as staple products. The production in such cases is so continuous that it cannot be readily segregated into lots or batches. The plan is therefore applicable only to what are known as specialty or fancy mills in which it is the general practice to process the material in lots of comparatively limited quantities.

In order to insure that all expenditures incurred are included in the cost, it is necessary that all labor performed and material consumed should be charged to some form of order: Production orders for all labor and material expended on product intended for sale, plant orders for all expenditures for plant improvement and extension, and standing orders for all expenditures that cannot be charged directly to either production or plant orders.

Production orders should be issued as the authority for processing all materials entering directly into the product. They should be numbered serially and all expenditures of labor and material on account of same should be charged to these numbers. It should be noted that it is not essential that an order should cover the complete process from raw material to finished product, but it is necessary that it should cover a complete stage of production.

Plant orders, like production orders, should be numbered serially and should serve the purpose of collecting the various items of labor and material expended on plant improvements and extensions.

Standing orders should be issued for collecting all expenditures of labor and material necessary for the efficient operation of the mill except those chargeable to production and plant orders and they will, therefore, embrace all indirect cost items. By means of standing orders, a minute and careful periodical comparison may be had of all manufacturing, administrative and selling expenses.

All disbursements of materials from stores should be priced at cost and charged to the proper order number. this will not only insure that all expenditures of material are accounted for, but it will also provide a means of collecting individually the material cost of several orders.

There are several methods in use for collecting labor cost data. It has been in the past quite generally the practice to allow the workman to make his own record, or have his foreman or overseer do it for him. A better plan is to place the responsibility upon timekeepers, whose sole duty it is to collect labor information. Time-keepers should be supplemented, so far as possible, with mechanical recorders which can neither err nor misrepresent.

After obtaining the direct material and labor cost, the next step in the tabulation cost is to apply the indirect cost or burden. We shall not attempt to discuss at length the various methods of distributing indirect cost. The problem is much simplified if the departments are so defined that only similar operations and processes are contained within a single department. Distribution of expenses may be divided into two parts: first the distribution of the general expense of the mill as referred to above, together with power, heat and light to the producing departments; and second, the apportionment of the total departmental expense thus obtained over the product passing through the departments.

The first is not, in reality, extremely difficult, but it does require a certain amount of patience and study to determine the most equitable method of distributing the several items making up this general expense. Power, for example, as mentioned previously, should be distributed on the basis of power consumed, depreciation on the basis of the value of the plant and equipment used by the department. In a similar manner each item of general expense

should be taken up, and the most equitable method of distribution determined.

The total departmental indirect cost thus obtained may be apportioned over the product by any one of several methods. It is quite generally desirable in textile mills, however, to use the machine hour basis or its equivalent, as the machine is largely the unit of production.

It will be readily seen that the cost of direct material and direct labor can be determined as soon as the order is completed, but that the exact amount to be added for indirect expense cannot be ascertained until after the close of the period.

It is, therefore, common practice in figuring current costs, to use the rates based on the results of previous periods. While this is the only practicable method to pursue when immediate cost figures are required, it nevertheless, is liable to error and should only be used when it is not practicable to wait until the close of the period.

The second method, that of operation costs, as the name implies, provides for the determination of the cost of individual operations. It is self-evident that, given the total cost of each operation and the loss by shrinkage of material from operation to operation, the total cost of any product, or the cost of any desired stage of completion may be found by combining these costs in the proper manner. They must, however, be combined only with a full knowledge of the shrinkage and the exact order in which the several operations were performed. This method is applicable to mills in which production is continuous and, therefore, is adapted to a large class of textile mills, especially those manufacturing staple cotton goods.

The foundation of operation costs rests upon an accurate knowledge of the production of each operation, or, stated another way, of the shrinkage from operation to operation. There are in use several methods of measuring production, but none of them entirely satisfactory.

Because of the well-known fact that the majority of the fibres used in the manufacture of textiles are subject to a considerable variation in weight, due to the rapidity with which they absorb and discharge moisture, if weight is used as the unit of measure it is subject to a corresponding variation. While lineal measure would solve this difficulty it would so complicate the recording of the quantities of stock in process as to make the plan impracticable. Everything considered, the most practical unit of measure for yarn, both finished and semi-finished, seems to be the pound. Cloth may be measured either by the pound or the yard, whichever is the more convenient.

As it is impracticable to actually weigh the product after each operation it is necessary to resort to some mechanical method of measurement. The most common method is the use of measuring clocks. Clocks are subject to possible error in that they measure the production based upon a fixed standard of efficiency, while it is, of course, self-evident that any individual machine will fluctuate in its efficiency due to a number of causes.

The collection of the cost data under this plan differs from that used in the first plan, in that there is no special production order number against which the various expenditures of labor and material can be charged and it is, therefore, necessary to use the operation as the unit of cost. It is essential to this scheme that the various operations be definitely determined and designated by a number. The several different kinds of product should also be numbered. A special ledger for collecting the cost data should be furnished in which provision should be made for collecting the direct material costs separately from the direct labor and the indirect cost.

All disbursements of direct material from stores should be priced at cost and charged in the mill ledger to the first operation through which the material passes, classified to kind of raw material. Provision should be made for crediting the several raw material accounts with the value of the waste made in each operation. The direct material accounts should be subdivided as to kind of raw material, rather than kind of product, as it is usually impracticable to obtain a report of waste classified as to kind of product. At best, the obtaining of accurate reports of waste made is a difficult proposition, especially in a mill where several kinds or grades of raw material are being processed along the same general lines, and quite possibly in the same rooms. It is important that this information be obtained as accurately as possible, in order that each operation and each kind of material may be credited with the proper amount for waste. The customary practice as been to consider that the shrinkage is the same for all kinds and grades of raw material and product. Shrinkages, on the contrary, are constant only in so far as the cause is either natural or due to mechanical appliances, and shrinkages due to "human elements" are subject to wide variation. Considering that the waste in woolen mills is over 50 per cent of the raw material and in cotton mills over 15 per cent, it seems well worth while to give this problem serious consideration. A mill agent once pointed to his waste wagon and aptly remarked, "there go our dividends." Apparently in many cases dividends might be increased if more attention were given to the reduction and utilization of waste.

All direct labor should be analyzed as to operation and kind of product and charged in the mill ledger to the proper account. The total indirect cost for each operation should be determined in much the same manner as explained under lot costs. It should then be apportioned to the several kinds of product and charged to the proper accounts in the mill ledger. At the close of any period, the unit cost of any operation may be determined by dividing the total expenditure on the operation for the period, as shown by the mill ledger, by the total amount of product which has passed through the operation during the same period.

The total cost of any given product cannot be determined simply by adding together the several operation costs, considering the shrinkage from operation to operation. To obtain the cost of any operation in the completed product, it is necessary to increase the operation cost, in reciprocal proportion to the shrinkage from the end of that operation to the finished product. For example, if the cost of an operation is $0.015 and the shrinkage of product is 25 per cent, the operation cost in completed product would be $\frac{\$0.015}{100\% - 25\%} = \$0.02$. It would be possible to determine the total cost of product by this method, except for the fact that the exact sequence of operations is not readily ascertainable, making it impossible to determine accurately the amount of shrinkage, especially in a mill making a variety of products.

A more satisfactory method is to build up the total cost, operation by operation, beginning with the first operation and charging forward to each succeeding operation the cumulative cost of all preceding operations, in-

ventories of course considered. This plan has the advantage, in that it follows the product from operation to operation, according to the manufacturing layout and schedule.

It is obvious that the output of an operation plus the waste made is equal to its input. Providing no inventory exists between this and the succeeding operation, the good output of the first operation is equal to the output of the second, including the waste made. Ordinarily, however, inventories do not exist and must, therefore, be taken into consideration. An equation taking inventory into consideration may be made up as follows: The good output of the first operation, plus the inventory of the product of that operation at the beginning of the period, less the inventory of that operation at the end of the period, is equal to the input of the succeeding operation. If it were practicable to determine the input of each operation, it would be possible by means of this formula to determine the inventory on hand between operations, at the end of any period; but in most instances there seems to be no practical method of obtaining the input of each operation. Consequently, a physical inventory of the product in process must be taken whenever the inventory is desired. With the inventory a known factor, by means of the above equation the quantity and value of the product to be charged forward from operation to operation can be easily determined. Each successive operation should be charged with the total cost of all preceeding operations, inventories considered, and by this means it thus becomes possible to determine the accumulated cost of any product at any stage of completion.

The accumulated unit cost may be obtained by dividing the accumulated cost at that stage of production by the output of the operation. This unit cost should be used in pricing the physical inventory of the product from that operation.

In many cases, the product of one operation is made into a number of different kinds of product in a succeeding operation. For example, one size of roving may be spun into several sizes of yarn and it is necessary in such cases to apportion the amount charged forward from the previous operation to the succeeding operation, based on the total production of each kind of product in the succeeding operation. It will be evident that by this method of cost finding, the inventory of product in process is automatically priced and, further, that it is possible to determine the cost of the product shipped during the period. The operation cost method not only provides for obtaining the detail costs by operations, but also the total cost of each kind of product.

Cost accounting is most valuable from the standpoint of the manufacturer, in that it shows numerous ways for reducing operating costs. It is self-evident that accurate costs are of fundamental importance as a guide in determining whether to meet or withdraw from unintelligent competition. They are also essential in the preparation of financial statements, as a knowledge of costs is absolutely necessary to the proper valuation of assets, and for the making up of a profit and loss account.

As heretofore mentioned, a mill or inventory ledger should be opened, designed to collect and control the various facts regarding the manufacturing costs and inventory records. This should be done regardless of whether costs are determined by means of the definite lot or operation plan. The mill ledger should be controlled by the private ledger and at the close of each period should be in balance with the controlling account in the private ledger.

The various items of expense not distributed or applying to product in process, should be so segregated that they can be easily checked against uncompleted costs and the uncompleted costs in turn checked against the product in process account. By this means at the close of each period, be it one or four weeks, or one of the calendar months or several months, the accuracy of the costs compiled during the period is demonstrated.

EBEN SUMNER DRAPER.

Massachusetts lost an honored citizen and the textile industry an able member when Eben S. Draper passed away at a local hotel at Greenville, S. C., on Thursday, April 9th.

A former governor of Massachusetts, he was born in Hopedale, which has ever remained his home, on June 17, 1858. He was the third and youngest son of George William and of Hannah B. (Thwing) Draper.

From childhood he was carefully trained to take his part in the great industry founded by his grandfather, Ira Draper, and now known as the Draper Company. From modest beginnings this machine shop gradually rose in importance till in the hands of the third generation, notably of the three brothers, General William F. Draper, George A. Draper and Eben S. Draper, it has become the largest cotton machinery plant, not merely in Massachusetts or in the United States, but in the world. To the day of his death and even during other activities and avocations, Governor Draper remained an active captain of industry in this, his chosen calling.

He began his political activities shortly after his admission into the firm of Geo. Draper & Sons, occupying a number of prominent state positions cumulating in his election as governor in 1908, followed by his reelection in 1909.

His share in great public affairs was, however, by no means limited to official life. At the outbreak of the Spanish war he was appointed president of the Massachusetts Volunteer Aid Association by Gov Wolcott and served as its executive head throughout the war.

One of the most important features of the work accomplished under his leadership was the purchase and equipment of the hospital ship Bay State at a cost of $200,000. Under his presidency the association raised more than $400,000 for the care of Massachusetts soldiers and sailors.

His experience in this field led to his being chosen as the head of the Massachusetts relief committee when Governor Guild called upon the citizens of Massachusetts for help at the time of the great San Francisco fire. The work was remarkably successful and in a short time the committee had at its disposal $1,000,000, which was spent in various ways in aid of the sufferers from the disaster.

At the time of the Italian earthquake, which caused so much devastation in and about Messina, he took an active part again at the call of Governor Guild. As a result of this work ,in which these two governors and Mr. Jas. J. Starrow shared, one million lire were sent to Italy.

It is perhaps worthy of note that both at San Francisco and at Messina the first cheque received came from Massachusetts.

His gift to Milford, of which Hopedale was originally a

part, the beautiful Milford Hospital will remain for ever as a monument to his benevolence.

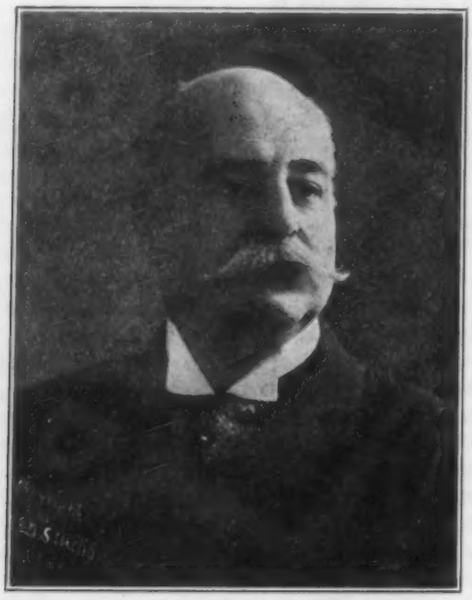
His business activities were various. In addition to his large share in the management of the Draper Co., he was associated with the Hopedale Machine Company, the Dutcher-Temple Company, the Hopedale Machine Screw Company, the Globe Yarn Mills, the Continental Mills, Lewiston, and the Glasgow Thread Company.

He served as president of the Manville Company, was director of the Milford National Bank of Boston, the Queen City Cotton Company of Vermont and the Sawyer Spindle Company of Maine.

He retained an active interest always in the Massachusetts Institute of Technology and was for a number of years a member of its corporation.

Hopedale during the period of his activity became a model town with perfect sewers, streets and water supply, a town of cottage homes, green lawns, gardens and shade trees.

Never one who shrieked his religion from the house



THE LATE EBEN SUMNER DRAPER.

tops, the Governor was a devout worshipper. A constant attendant at divine service ,the beautiful Unitarian church at Hopedale was in part his gift. He was in every way actively and generously identified with that particular form of Christianity, a working force in the American Unitarian Association and president at the Unitarian festival.

It was natural that the social life of such a man should be large and varied. He was a member of the Society of Colonial Wars, the Metropolitan Club of New York, the Hope Club of Providence and the Somerset, Algonquin, Union, Middlesex and Massachusetts Clubs at Boston.

His home life was singularly happy. He maintained two beautiful houses, at Hopedale and on Beacon St., in Boston. In 1883 he was married to Miss Nannie Bristow, daughter of Gen. Benjamin H. Bristow, former secretary of the treasury. Three children were born to them, B. H. Bristow, Eben S., Jr., and Dorothy.

A year ago his quiet and useful life was disturbed by a dastardly strike at his works, organized by the infamous I. W. W. Though the anarchists were defeated after countless acts of violence and the company gained a complete victory, the strain, coming after the other frightful strain to which Massachusetts, with her yearly elections and agonizing protracted legislative sessions, subjects all her governors, was not without its serious effects on his health. To this was added the reported loss of his younger son in the Arctic and finally the crushing blow of the death of his beloved wife. This succession of trials broke down even his splendid physique.

In the words of Curtis Guild, also a former governor of Massachusetts, and for many years in close personal touch with Governor Draper, "he leaves behind him as a heritage something better than wealth, better than memorials in hospitals and churches and public monuments. He leaves the memory of a devoted son, brother, husband and father. He leaves an example of public spirit, probity and courage in the leadership of his fellow citizens. He has passed from among us crowned with the highest praise that man can give his fellowman, for those who knew him the most thoroughly, respected him the most highly, and loved him the most dearly."

HANDLING AND MARKETING COTTON.

"There is not a single important step or process in the entire cotton handling and marketing scheme which owes its origin to a special consideration of the producer's interests," is one of the conclusions reported by the Office of Markets of the United States Department of Agriculture in its Bulletin No. 36 on "Studies of Primary Cotton Market Conditions in Oklahoma."

These studies began in October, 1912. They have covered 103 cotton market towns of Oklahoma, involved the sampling of over 3,200 bales of cotton, with records of date, place of sale, and price paid to the grower. They also involved careful grading and stapling of these samples, and a close comparison between the prices paid to the grower and the actual differences in grade. As a result of these studies, the investigators find that practically every feature of the handling and marketing system is retained because of the insistence of some one of the numerous middlemen and carriers who have at best only a temporary interest in cotton. Even the spinners' desire for a better bale, kept under shelter until it is shipped to the mill, and with a covering which would keep the cotton clean and dry, is systematically ignored.

These conditions apply to many other cotton markets in the South. Partly as a result of the findings, the Office of Markets is now conducting extensive investigations in 80 typical local marketing points throughout the cotton belt.

The investigation showed the following conditions: Actual quality above middling has little effect on the price paid to the producer because:

(a) In general, the ginners, who buy a large proportion of the cotton, pay very nearly the same price for all cotton purchased on a given day.

(b) In many street markets, even where there are a large number of buyers, widely differing prices are paid on the same day for bales of identical quality. There is no uniform price even for middling cotton.

(c) The differences fixed by Oklahoma firms allow only about one-half as much premium for grades above middling as do the differences of the New York Cotton Exchange. This, however, should not be construed as an approval of the New York fixed difference system.

(d) In actual street buying the premiums paid for bales grading above middling are far less than the locally advertised differences for such grades. In some cases the bulk of the cotton is bought as middling for weeks at a time, when a large majority of the bales are actually above that grade.

(e) Except in the southeastern part of the state, no attention is paid to length of staple in fixing the price of the individual bale, but certain regions receive slightly higher prices than others because of reputed superiority of average staple.

(f) The cotton trade in Oklahoma recognizes no grade above good middling, although many thousand bales of higher grade are produced.

From these conditions it is apparent that accurate knowledge of cotton grading is of little value to the producer in marketing his individual crop under present conditions. The prices paid to farmers both for seed cotton and for lint are too largely based on a system of averages. This works great injustice to the producers of the best grades, and discourages careful picking and improvement of varieties in length of staple. The greatest losses to the farmers under the present system of marketing appear to lie in their failure to secure the premium for their high grades which these bales finally bring.

The farmer is not a party to the neglect which results in most of the country damage, but he receives no compensation for any extra care which he may bestow upon the finished bale. No evidence has come to light that any attention is paid to the variety of short staple cotton grown when fixing the price. In other words, the only advantage derived by the grower of an improved variety is the advantage which may result from its larger yield per acre, its higher percentage of lint, or some strictly cultural characteristic.

To bring out the general relation between the price of middling cotton in different local markets in Oklahoma as compared with the Galveston closing price of the preceding day, four middling bales were selected at different times in fifteen towns, their range of local price noted, and difference from the Galveston price determined.

It was found that the range in price paid in a local market for different bales of middling cotton varied from $0.75 in Duncan to $6.00 a bale in Erick, where on the same day $52.00 and $58.00 were paid for a bale of this same grade.

The difference between local average middling prices and the Galveston price varied from $0.60 in Ryan to $5.20 in Marietta. There seems to be no regularity in variations between local prices and the Galveston prices. In Norman at different times the differences from the Galveston price were $1.05, $2.19 and $3.10. All figures are based on random sampling, but bales sold in round lots were excluded. The figures do not represent the extreme ranges on the days samples were taken, as the collectors usually secured samples before learning the price for which the bales sold. That the price of middling is often more variable than any other is brought out by the figures for Cordell on November 8. A total of 13 bales were sampled. Of these, 3 were middling, and the extreme variation in price among them was $5; 3 bales were strict middling, and the extreme variation in price among them was $3.75; 5 bales graded strict low middling, and the extreme range in price was $2.50; 1 bale of good middling brought $60, the highest price among these 13 bales, but a low middling spotted, the poorest bale of the 13, brought exactly the same price.

The investigation showed that in the case of strict middling cotton in the same local market the difference in price for bales of this grade would vary from $2.00 to $7.25.

In the case of low middling cotton in seven markets the price variation on the same day was from $2.20 to $12.50 a bale. In the case of strict low middling cotton the variation ran from $2.50 to $3.00 per bale.

Summing up this feature of the investigation, it may be stated that the fluctuations in prices paid for any grade of cotton from day to day, or during any one day, exceed greatly those justified by any change in the buyers' limits or in spot transactions in the great cotton markets.

According to the investigators, the whole question of the application of the difference sheet in Oklahoma appears to be in a chaotic condition. In general, the premiums offered by Oklahoma firms for grades above middling are about one-half as great as those of the New York Cotton Exchange. For the grades below middling the penalties are, in a general way, almost twice as great. The results of the investigation show conclusively that the difference sheet receives little attention in fixing the price offered the grower.

Summing up this whole matter of premiums and penalties, we may say that the farmer sells his cotton subject to comparatively little variation in price in consequence of variation in grade, but that he is subjected to a process of averaging to which he is not consciously a party, which is based upon no definite consideration of his rights or interests, and which must inevitably be so adjusted as to leave a hidden profit for the buyer. This system of averages is arrived at by rule of thumb, is never reduced to writing, and is subject to no supervision or adjudication.

Averaging prices on the original purchase of cotton is a vicious practice, because it is impossible to distribute equitably its benefits and burdens. By this system the careful and progressive are regularly penalized for the benefit of the indifferent and thriftless.

For some reason not satisfactorily explained, the cotton trade in Oklahoma recognizes no grade above good middling. All strict good middling and middling fair bales are expected to be graded and sold as good middling. The reason for this practice is alleged to be that the higher grades are not produced in sufficient volume to permit full car lots to be concentrated for shipment. Consequently small dealers or farmers cannot get a cent above good middling price for strict good middling bales, even when their actual grade is admitted by the cotton merchant.

The bulletin then cites investigations at nineteen points in which the average price per pound paid for a lower grade cotton was more than the average price paid for certain higher grades of cotton on the same day. This condition was found in about one-fourth of the markets in which extensive sampling was undertaken.

In speaking of the effect of competition, the bulletin states:

"Mountain Park has only two buyers, but Mangum has twenty-seven street buyers, and we must assume that everything which competition can do to force proper respect for quality is done in Mangum. By what operation of the competitive principle does it happen that a low middling bale can be bought for $1.55 less than the average price of four

ordinary bales, when, by the published differences of the trade, it should bring $13.75 more than an ordinary bale?

"A study of these facts leads to the conclusion that prices on individual bales are fixed by some consideration into which local competition for the cotton does not enter appreciably. In a majority of cases the actual grade of the particular bale does have a real influence on its price, but not to the extent that it does in later transactions between dealers. Most of the buyers are the subordinates of middlemen. A multiplicity of buyers means that just so many more men are living on the profits made on the cotton of the community after the farmers have parted with it."

Chapters are devoted to the marketing of "bolly" and "gathered" cotton, and to the system whereby growers of diversified products, having but a few bales of cotton to sell, sell exclusively to general merchants. The merchant, because he buys cotton as a means of collecting open accounts and securing general trade, gauges his offer by the value of the farmer's good will rather than the exact grade of cotton. This mixing of bill collecting and cash trading with cotton selling is destructive to close discrimination between grades and a scale of prices based on the real value of the cotton.

The fluctuations of prices in primary markets also are considered, and the figures indicate rather pointedly that the grower does not receive, by any means, the full benefit of a rise in prices at the port. There seems to be no exact connection between the Galveston prices and the local prices; when the trend is upward the local prices advance rather slowly, without any definite ratio to the prices in Galveston.

The report finds that no relief from this condition can be expected while grading is wholly in the hands of the buyers. As long as this is the case the cotton will never be closely graded until after it has left the growers' possession.

Cooperation among growers, if properly organized, would probably furnish some measure of relief, but under present conditions a rather expensive selling department would probably be necessary.

The Department of Agriculture stands ready to advise the growers in their marketing enterprises, whether in Oklahoma or elsewhere. A plan of cooperation is now being tried out in Arkansas in grading and marketing cotton. The department will furnish sample drafts of by-laws and constitutions that should be of practical use for organization. All communications regarding this matter will receive careful attention if addressed to the Office of Markets, United States Department of Agriculture, Washington, D. C.

The third official forecast of the cotton crop of India, which summarizes the provincial reports up to November 30, 1913, states that the season has, on the whole, been favorable, except in parts of the Bombay Presidency and of the Central and United Provinces, in which sections the crop has suffered more or less through drought. The total area under cotton in all territories reported is 23,900,000 acres, as against 20,900,000 acres at the same date last year. The total outturn is estimated at 4,928,000 bales of 400 pounds each, as against some 4,300,000 bales estimated at the same date last year. To this figure might be added some 1,000 bales as the estimated yield in the native states in Bihar and Orissa, which make no returns.

R. B. MACLEA.

R. B. MacLea, one of the country's best known importing dry goods merchants, died recently at Manchester, England, where he had gone as the representative of Clarence Whitman & Co., Inc. While he had not been well of late, his death was entirely unexpected by his many friends.

Mr. MacLea was born at New Orleans February 22, 1845, and when he was 15 years of age he went among the Indians of Canada and lived with them for two years, hunting, trapping and fishing. His father, Kenneth MacLea, had become engaged in the international shipping business in an office on Bowling Green, and the boy came out of the woods to New York to seek work here. He was attracted by an advertisement in The Journal of Commerce and replied in person to it, becoming connected with an old dry goods firm. Later on that firm became MacLea Austin & Wellington, the predecessor of W. L. Wellington & Co., and Howe, Brooks & Co. Mr. MacLea left the first-named firm to enter partnership with a Mr. Harriman, under the firm name of Harriman & MacLea, dealers in wool goods. The firm's affairs became entangled, but Mr. McLea pledged his private fortune to them, and finally succeeded in an after-panic period in paying every dollar owed, a feat that was remembered to his credit during all his business career. The firm of R. B. MacLea & Co., was formed after the liquidation of the old firm, and this in turn became the R. B. MacLea Co.

For 40 years Mr. MacLea represented in this country the famous Bolton Mills of England, as well as some of the choicest Continental accounts. He was known as a leader in sensing styles and he was an excellent judge of desirable merchandise. Even in times of bitter political conflict, his enemies would refer to him as an "honest importer," and this was his reputation to the close of his life.

The R. B. MacLea Co., is still in existence, but a few months ago Mr. MacLea became the head of the foreign department of Clarence Whitman & Co., Inc., and had prepared to import for that concern all the choice fine specialties that could be profitably handled in conjunction with the firm's large domestic interests. From its inception, it was recognized in the trade that the connection for both parties would prove popular and profitable, both because of the high business reputation and skill of the deceased, as well as the desire of the Whitman house to remain at the head of fine and fancy cotton goods trading in this country.

The R. B. MacLea Co., will probably be liquidated by R. K. MacLea, the well known son of the deceased, who was with his father in business for nearly a quarter of a century until a couple of years ago when he became the representative of the Parker Cotton Mills Co.

In addition to the son referred to, deceased leaves a widow and daughter. His father, who is nearly 100 years old, is still living in one of the suburbs of London, Eng.

The South is developing the most prosperous and successful manufacturing centers, making a wide line of articles for home and outside consumption.

The water powers of the South, developed and undeveloped, comprise a very large portion of the available water power of the United States.

THE MADELINE HOSIERY MILL.

An interesting feature of the textile situation in Chattanooga, Tenn., was the recent opening of the Davis Hosiery Mills' new branch or annex at Ridgedale, as the extreme eastern section of the city is known. This annex is a few miles south of the main plant, so as to bring its labor from a different section, being located just across the street from the Standard Processing Company. It is styled the Madeline Hosiery Mill, in honor of the daughter of Henry Garant, superintendent of the principal mill. The name might be construed as having a double significance, as nothing but misses' hose is to be made in the annex. The product is carried through only the primary processes, as it is conveyed to the main plant for dyeing and finishing.

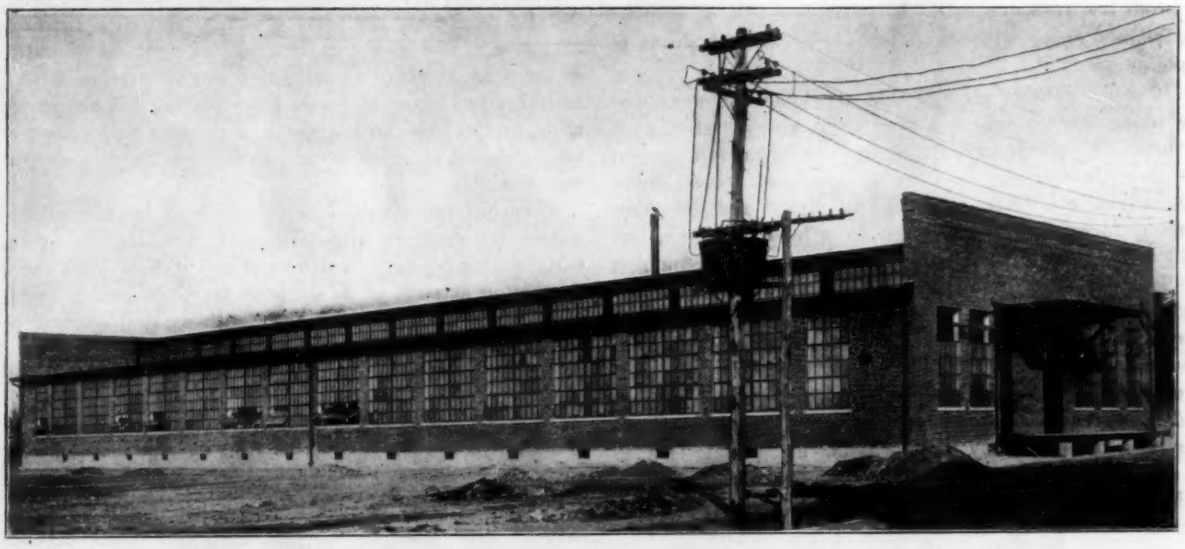
The first and perhaps the most striking feature of the plant is its efficient lighting facilities. A very large area of the east and west walls (the building runs north and south) is made up of prism glass. This allows the light rays to be distributed where and in the manner in which they will do the most good. This admission of natural light is increased by the introduction of a large monitor in the roof, extending with the greatest dimension of the room.

The plant, one story in height, is 60 by 200 feet, giving a capacity, when all machines are installed, of about 400 knitters, 600 ribbers and 60 loopers. The ultimate production will be 2,000 dozen pairs of hose daily. This equipment will require the employment of about 200 operatives.

The machinery equipment consists of big dial German loopers, Brinton ribbers and Standard knitters. These machines are installed in batteries, driven from long shafts, at the end of each of which a Triumph motor furnishes the impetus. Power is used from the Tennessee Power Company, that concern being one of the two competing companies ready to furnish 150,000 horsepower in Chattanooga and vicinity.

The enlargement of the Davis plant by the addition of this mill serves to emphasize the advantages of Chattanooga as a center for the textile industry. Power is an item for the textile manufacturer, and Chattanooga now has the cheapest power in the United States, not excepting even Niagara Falls. Cotton will reach, in an uncompressed state, all mills located at Chattanooga at freight rates ranging from $1.00 to $1.50 per bale of 500 pounds. This statement should, perhaps, be amplified by the explanation that Chattanooga already has a spinning mill, but there is room for more. Like the nineteen Georgia cities and towns cited in COTTON last month, special inducements will be offered prospective manufacturers in many lines.

Perhaps the one greatest factor in the locating of a textile plant of any description is the availability of competent operatives. An ample supply of white native labor of a high grade is available at Chattanooga from the immediate vicinity as well as from the mountain counties of Tennessee, Georgia, Alabama, Kentucky and North Carolina. When the Madeline mill opened, two or three times the number of operatives were on hand that could possibly be used.



THE NEW BRANCH MILL OF THE DAVIS HOSIERY MILLS AT CHATTANOOGA, TENN.

Chattanooga is as easily reached as any city in the southern tier of states. A manufacturer can ship in many directions without having his products waste time by going in a roundabout manner. Freight rates on textile goods are reasonable, and the Belt Line Railway provides a way for all manufactured products and supplies to be handled direct with the mill without transferring from the original cars. This Belt Line Railroad has fifty miles of main line and side tracks, extending around the city, and delivering cars to and from ten railroad lines. This allows the mills to be served on their own side tracks and makes the city a practically perfect distributing point.

The value of cotton goods imported in 1913 amounted to $63,938,983.

An association of cotton manufacturers has been organized in Moscow, comprising 47 factories and representing a total of 3,700,000 spindles.

The value of cotton goods of domestic manufacture exported during 1913 amounted to $53,743,977. Exports of cotton cloth, which amounted to 444,729,241 square yards, were valued at $30,668,234.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

The majority of Southern manufacturers during the past month have spent more time discussing the coming conventions in New York, Philadelphia and Boston and the Fourth Annual Textile Exhibition than they have utilized trying to foretell what the future was to bring forth from a manufacturing standpoint. The Duke warehouse plan and its ramifications is also one of the pet subjects for discussion wherever two or three manufacturers get together.

The real manufacturing situation is apparently resting on its oars, so to speak, and while contracts continue to come forth, complaints are still numerous that the margin of profit is extremely small. It is largely a case of keeping the wheels going with some mills whether any profit is made or not.

It seems passing strange that the labor agitators and the union leaders who are over them always select such unfortunate periods to begin their work of unionizing textile operatives or for insisting on increased wages, union recognition, etc. Not only is Fall River and the East looking forward in anticipation to a labor uprising, but Fall River agitators are circulating throughout a number of Southern mill districts in an endeavor to create a disturbance among the mill operatives of this section. That they will meet with a dismal failure is a foregone conclusion, for the reason that the majority of Southern mill operatives are thoroughly satisfied with present conditions and are altogether too sensible to throw away any money they may have saved by joining unions and paying salaries to agitators and speakers for the sole benefit of having the union recognized by the manufacturers for whom they work.

The Southern finishing plants, while few in number, are comparatively well supplied with work, and in fact, could in many cases, handle no more, as their capacity is being taxed to the utmost. On the other hand, some Southern mills which sell their product converted, and who have in the past been having this converting done in various parts of the Eastern and Central states, are considering seriously the installation of small finishing plants in connection with the mill itself because of the uneven quality of work at times secured through the medium of jobbing plants.

The cotton situation continues to plague the manufacturer with its irregular price variations between spots and futures. Manufacturers who in years past have purchased all their cotton through local brokers on "call" now find it impossible to do so because brokers claim that under the present conditions it is impossible for them to hedge such sales through the New York market. This is causing considerable difficulty and is even necessitating the refusal of goods ordered on the part of mills because they are not in a position to foretell what the future may bring forth in the line of cotton prices, and any such quotations for future delivery made at this time would be a matter of pure speculation.

Signing himself "Cotton Man," we note the following letter addressed to the *Charlotte Observer*, in reference to the New York cotton contract, in which one feature which works injury to the manufacturer is pointed out:

"Unfortunately, our legislators are not familiar with the injury to farmers and manufacturers caused by what is known as the "basis middling" system used by the New York Cotton Exchange, which allows the seller to deliver any grade he wishes on a contract regardless of what the buyer may want, or, in other words, it is altogether one-sided and in favor of the seller who can combine and ship to New York say 100,000 bales of low grade cotton which the mills generally cannot use, and which the ordinary speculator cannot take, because they have not sufficient money, consequently when this cotton is offered to them they simply sell out their contracts at a loss, which forces the quotations down regardless of the price of actual cotton, thereby depressing the price of actual cotton in the hands of farmers, and at the same time making false quotations of the price at which actual cotton can be purchased. This restrains the buyer of goods from placing his orders with mills, as the New York quotations indicate that cotton can be purchased at much lower prices than the manufacturer can obtain it.

"No bill can possibly be fair to both buyer and seller unless the contract stipulates that middling or average middling cotton shall be delivered and if New York cannot do this on account of its distance from the cotton fields it should have warehouses in the South or stop quoting cotton. They can and do take 100,000 bales of low grade to New York, and with this control the price of a 15,000,000 bale crop."

In reference to the much-written-about cotton contracts, it would seem that Senator Smith's bill for the regulation of cotton exchange contracts has simmered down to about nothing—certainly to such a shape that it will be productive of little good to the mill men, for whose benefit it was partially designed. It would naturally be inferred that in order to escape the evils of the New York Cotton Exchange it would only be necessary for the manufacturer to let it alone, and refuse to trade with it, but in the letter quoted above it would seem that this is not the case. By keeping on hand in New York about 100,000 bales of a low average grade of cotton and carrying no other grade of spot cotton whatever, regularly, the Exchange is able to make future quotations at very much less than the cotton can be bought for. Complaint is heard on every hand that the arrangements of the New York Cotton Exchange are not just and equitable. However, the changes now made and being made will no doubt greatly improve past conditions.

Among the mill news items of interest will be noted the fact that Greenville, S. C., mill owners have practically agreed to establish a trunk system of sewers throughout the various mill villages which surround the city of Greenville. Announcement to this effect was made by Dr. Clarence E. Smith, the city health commissioner, recently. According to an estimate made by J. E. Sirrine, the well-known mill architect, and engineer, this trunk system of sewers will cost approximately $8,000. Sewers will first be established in the mills, but the system is to be so arranged that connections may be made to all the houses in the villages if such aplan is deemed advisable. In this

connection, it is also interesting to note that only a short time ago these same manufacturers were investigating the cost of installing and operating a cooperative gas works in connection with their various mill villages and entirely separate from the Greenville plant. It is their intention, if the system looks feasible to at some future date install such a gas plant and furnish gas to the operatives' homes for cooking purposes at the rate which will cover the cost of up-keep and operation, etc.

Extensive improvements are being made in the plant of the Coosa Mfg. Co., at Piedmont, Ala., and the new equipment contracted for consists of Nasmith combers, sliver and ribbon lap machines, Fales & Jenckes spinning frames and twisters. The American Moistening Company is also installing in this mill a new system of motor driven fan type humidifiers with automatic controllers.

Plans have been completed by W. H. Kline, president of the Yazoo Yarn Mill, and C. H. Goodroe, superintendent of the same mill, to establish a knitting mill in Yazoo City, Miss., with a capital stock of $50,000.

At a recent meeting of business men held at Bluff City, Tenn., plans were considered for the establishment of a hosiery mill at that place and a stock company is being formed, half the stock to be taken up by local men and half by outside interests. The capital stock is reported to be $25,000.

The P. H. Hames Knitting Mills Co., at Winston-Salem, N. C., has been granted an amendment of its charter, whereby it may increase its capital stock from $400,000 to $2,000,000. It is believed that a very considerable increase will be made in the size and equipment of the company's mills in the near future.

The Lumberton (N. C.) Cotton Mills are to install sixteen spinning frames and some additional carding machinery.

The Arista Mills at Winston-Salem, N. C., has received the first shipment of the 236 Stafford looms which they are to install in the South Side Mill of this company.

The Issaqueena Mills at Central, S. C., are installing 314 40-inch Mason looms to replace their present old narrow looms, which are being thrown out.

The Beaver Dam Mills at Edgefield, S. C., are installing some new machinery.

The Pickett Mills at Rockingham, N. C., have recently purchased nineteen spinning frames to add to their present equipment.

George Giles, of Ocala, Fla., is contemplating the establishment of a knitting mill at that city. This will be the first endeavor of the kind in that particular section.

NEW ENGLAND MILL SITUATION.

Without any appearance of great improvement in the volume or value of new business offered to the mills in the interval there has come to the surface a better sentiment concerning the possibility of weathering what portended to be a most unsatisfactory summer in cotton manufacturing. Manufacturers themselves say it is hard to point out the factors warranting the improved feeling that undeniably exists. There has been some additional business booked by mills making print cloth yarn constructions and there has been no material gain in the stock on hand reported in the large centers. The printers continue generally busy, the bleachers are moderately well employed, and some parts of the finishing trade report many small rush orders without any appreciable gain in forward business.

About 10,000 bales of standard drills have been sold for shipment to India, the price accepted being 7¾ cents. After this volume of goods was disposed of the price was moved back to 8 cents and that figure holds for all deliveries forward from July. No business has been taken at the higher price. The last reports of print cloth conditions at Fall River showed that the mills there are about 60 per cent sold, under contract through April, and 55 per cent for May. With the normal volume of spot business to be maintained there can be little or no accumulation of stocks at that center before the first of June, and the figures show that stocks are now hardly a week's production more than they were at the opening of the year.

Selling agents handling the better known lines of bleached cottons have maintained prices steadily and they have been able to sell their output up to this time. Accumulations from this time forward will not be anything more than normal until the early part of June when jobbers usually begin to replenish their fall stocks.

During the month there was a decline of ¼ cent a yard on the prices asked for two of the well known lines of Southern staple ginghams, but the largest producer of those goods in New England made no change and has been able to sell ahead through May at current rates. A larger business on low priced dress ginghams could readily be handled yet the looms are well employed on old orders in some of the mills, and where there is a need of orders in other quarters, there is no disposition to crowd for business at price concessions. The staple shirting trade on chambrays and staple checks for aprons and children's dresses is still large enough to occupy many looms.

A great deal has been said in distributing markets of the declining demand for ratine weaves of various descriptions. Thus far the mills employed on yarn dyed fancies of this general character have had no difficulty in shipping everything ordered, and on goods that will retail under 29 cents a yard there is even now many requests for prompt shipments of additional small lots. Cloths of yarn dyed construction of the crinkled seersucker type and crepe types are in good demand and they have sold very well for fall delivery. Two of the branded lines have sold better than ever before.

There has been more steadiness in prints and percales than is customary at this period of the year when general business is at all disturbed. The printers are busy and will continue active on percales throughout the balance of the half year if no further business comes along. The trade in narrow staple prints has been more satisfactory in the past four to five weeks than it has been in several months. No large individual orders have come in but there has been a steady and general buying movement stimulated solely by the need for goods, and by the light stocks held by the jobbing trade all over the country. Even the largest printers of narrow staples have adjusted themselves to the limited system of ordering which obtains today in all lines.

Printers of plisses, crepes, and sheer fancy cloths, have found business active, and two of the finest printers of this class of merchandise will accept no further business for delivery this side of July 1. In many respects the fancy printed goods season is better than it has been in several seasons, but the cloths used have been of the crepe, or novelty order. Latterly there has come forward a de-

mand for organdies, lawns, batistes, and other very sheer goods, and some business of fair sized volume is already outlined for the spring season of 1915.

The demand for fine transparent organdies has been better than for several years. While the orders do not amount to a great deal measured by the standards of years when this class of merchandise was widely used, they clearly indicate the trend to more sheer products. This is based upon the changing fashions in women's wear, and already the yardage of material is increasing and is beginning to be felt in the requirements from the cutting trades. Lace cloths, fine leno weaves, and a very substantial trend to mock lenos, have served to give new impetus to the fine fancy trade. In the second week in April fully 50,000 pieces of mock lenos were contracted for by New York converters who have not used a piece of that class of merchandise in some years.

It is difficult to accurately estimate the idleness in various centers. At New Bedford, during the early part of April, there was a distinct tendency to shut down looms when orders expired, but toward the early part of the month business began to grow better and there is a distinct shift to finer yarns from long staple cotton. The mills are not rushing to abandon the lower counts they have been making during the vogue of ratines and crepes, and the prices named on some of the very sheer goods are not altogether attractive. At the same time the market demand is plainly setting toward finer yarn goods and mills are showing a broader desire in trying to meet it.

Coarse colored cottons are selling moderately but mills could readily handle more business than they are getting. The prices on some of the better qualities of denims and tickings have held fairly steady. Wherever there have been price concessions they have been made on the less well known goods made by some of the smaller mills. Standard 8 ounce tickings are still held at 13½ cents and the best known makes of 9 ounce denims still bring 17 cents, but that these figures have been shaded on some sales is not disputed in agents' circles. The lower priced business has not been done for the purpose of inducing late orders, as jobbers and cutters have not been operating and mills have not been keen to make reductions on anything save a few stock goods.

There has been no change in the napped goods situation. The mills are busy on old orders and from time to time they are called on by cutters for deliveries of stock goods which they have not in hand. So many new small uses have developed for certain weaves and finishes of light weight napped cottons that some mills have been well supplied with business even though the initial jobbing business for the year was disappointing. The blanket mills continue to run in full and with every prospect that they will have no stock to dispose of this side of October.

The depression that hit the low end of the quilt business early in the year still continues and it is possible to find idle quilt looms in some mills. At the same time the demand for satin quilts is maintained. Prices on low grade crochet and crinkled goods fell off fast and the market is well supplied, if not over supplied on some of the lines selling from 65 to 82½ cents. The maintained high price of choice white cotton has done much to deter mills from accepting late orders unless they were based upon stocks in hand at the prices jobbers are willing to pay.

Fears of a wage trouble are still common in mill circles. Representatives of the I. W. W., have been at work in various places and are hopeful of stirring up trouble in the near future. Mill men believe that general conditions are so adverse to any disturbance of existing wage scales that they can avoid trouble of a serious character and at the same time they recognize that the many sporadic cases of discontent heard of from time to time can become contageons if general business improves before midsummer.

Machinery men are only moderately busy. They are unable to get prices up on many things and they are indisposed to encourage investment in new properties while values are unprofitable. A few of the larger concerns continue operating full time but they are not employing their full quota of workers. There is a considerable number of small orders coming in from time and the mills are still continuing the throwing out of narrow looms. The death of Eden S. Draper during the month was felt very keenly in New England, where he is best known and where he had been a progressive factor in developing the cotton mill industry.

The situation in the yarn mills is peculiar. Some of the finest yarn mills are doing a steady and profitable business. Others are curtailing and are talking of passing dividends. The competition for business on staple numbers has never been sharper. At the same time some of the mills that specialize on yarns for particular purposes have been able to secure a full share of business and they are not complaining. The excellent business that has been done on tire goods has helped many of the mills over a hard period, and some of the mills that specialize on yarns for dress goods and men's wear are doing well. On some of the low staple numbers down as far as 2 ounces some Eastern mills have been competing more closely with Southern spinners than ever before in their history.

COTTON CROP CONDITIONS AND A REVIEW OF THE MARKET.

BY H. AND B. BEER, NEW ORLEANS.

The sustaining feature ofthe market the past month was the unfavorable weather experienced in the cotton belt, especially in the Mississippi Valley states and in Texas, which delayed preparations for the new crop and made the season backward. There is one redeeming feature of the situation, however, and that is the good supply of moisture in the ground in all sections of the belt.

In the meanwhile consumption of cotton throughout the world continues on a record breaking scale. According to the International Federation of Spinners' Association, indications are that the world will consume 15,050,000 bales of American cotton this season, against the previous record of 14,903,000 bales last season, and spinners' stocks throughout the world on March 31st, were 300,000 bales smaller than they were on the corresponding date last season.

The substance of this report is reflected in the large consumption by the mills in the United States, which, according to the Census Bureau, was 519,000 bales during the month of March, compared with 486,000 for the corresponding month of one year ago. The same authority places manufacturers' stocks of raw cotton in the United States on March 31st, at 134,000 bales less than on the same date last year, 1,704,000 bales against 1,838,000, and the number of active spindles at the close of March is given as 31,137,000 vs. 30,575,000 on even date last season, which

indicates the continuance of a large consumption in this country.

In view of the fact that consumption of American cotton by the world during the past two seasons will be about 30,000,000 bales, or about 1,000,000 bales more than was produced in the South, which was about 29,000,000 bales, and which large consumption was only made possible by spinners drawing heavily upon their reserve stocks, it is apparent that the world will have need for a record crop next season in order to meet the increasing demand and to replenish exhausted reserves.

The question at issue is, therefore, what will be the size of this year's crop, preparations for which are now under way? It is probable that the acreage will be increased, perhaps to the extent of an average of 5 per cent for the whole belt, which would bring the total area up to about 38,000,000 acres. The use of fertilizers will be on an increased scale, in the east gulf and South Atlantic states, according to official reports, by 10 to 15 per cent. Sales of live stock and farm implements are reported to be large in all districts of the South, and intensive cultivation will be the rule to follow. Under the circumstances it looks as though the South will make every effort to make another 16,000,000 bale crop, as was produced in 1911.

The making of a crop, however, that is a record yield, will depend more on the character of the weather to be experienced during the planting and growing season than on the increase in acreage, increase of fertilizers, etc. Last year prospects in all sections of the belt were brilliant until well into July, and a yield of 16,000,000 bales was generally predicted. But a severe drouth set in over Texas and Oklahoma, causing a loss of about 1,000,000 bales, and the excessive rains in the harvest time lowered the grade in all districts of the cotton region. Final results were that a crop of only 14,600,000 bales, including linters, was obtained.

In addition to the uncertainty of making a very large crop this year, there is such a scarcity of cotton in the South today that there is the possibility of a summer squeeze. Already cotton is being brought back from Liverpool to New York for delivery on May contracts, and it is said that about 25,000 bales will be shipped from Liverpool for that purpose.

Since such is the case, the situation in this country, from a supply point of view, may become all the more acute by the time July rolls around. After March 31st, last year, exports to Europe, and American mill takings totaled 2,426,000 bales. On the basis of a crop of 14,700,000, we can trace an available supply in the United States on March 31, this year, of only 1,706,000 bales.

THE YARN MARKET.

The yarn market for the past month has indicated a demand for small lots with delivery fairly good. Early in the month carded yarn hosiery manufacturers bought for prompt delivery while the middle of the month found prices irregular, and while some larger quantities sold at lower rates than the smaller ones, dealers were complaining about carrying yarns over on old contracts. Collections were not particularly good. The Southern spinners, however, seemed to be optimsitic and are prophesying higher prices for both cotton and yarn.

One of the features of the present yarn situation, is the inability of some mills to accept orders for future delivery owing to the unstable condition of the cotton market at the present time. Heretofore many manufacturers of yarns were accustomed to purchasing their cotton on call and allowing the broker from whom they bought to hedge his sale in the New York market, at the present time such brokers refuse to accept business on these terms, particularly in some Southern sections, and therefore the manufacturer is up against a peculiar proposition. This difficulty is caused by the disparity between spots and futures, and until such conditions become normal, it is doubtful if any very large deals will be put through for future delivery unless the corporation is of sufficient size and capital to enable it to buy as much cotton as it might desire and hold it for filling the orders.

There was also a further scaling down of prices in the New York market around the middle of the month and as the month closes, it finds the members of the Cotton Manufacturers' Association, who are meeting in New York for their annual convention at this time, discussing present yarn and cotton market conditions and the probable result thereon of the new Duke warehouse plan which is creating a wide amount of interest among the members of this association.

Following are recent quotations from the Philadelphia market:

Southern Single Skeins.

April 11.

8s	18 @19	16s	20½ @21½
10s	19 @20	20s	21½ @22
12s	20 @20½	26s	23 @23½
14s	20 @21	30s	25½ @26

Southern Two-Ply Skeins.

4s to 8s	18 @19½	24s	23 @23½
10s	19 @20	26s	24
12s	19½ @20½	30s	25 @25½
14s	20 @21	40s	29 @30
16s	20 @21	50s	35½ @36
20s	22	60s	44 @44½

Carpet and Upholstery Yarns in Skeins.

9-4 slack	20 @20½	8-3-4 hard twist	18 @18½
8-4 slack	20		

Southern Single Warps.

8s	19 @19½	20s	22
10s	19½ @20	24s	23½
12s	20 @20½	26s	24
14s	20 @21	30s	25½ @26
16s	20½ @21½	40s	30

Southern Two-Ply Warps.

8s	19 @19½	20s	22½
10s	19½ @20	24s	23½ @24
12s	20 @20½	26s	24 @24½
14s	21 @21½	30s	25½ @26
16s	21½ @22		
22s	24 @24½	36s	28 @28½
24s	24½ @25	40s	30 @31
26s	25½	50s	36
30s	26 @26½	60s	45 @46

Two-Ply Combed Peeler Skeins.

20s	29	50s	43 @45
24s	30	60s	45 @52
30s	31½ @32	70s	45 @52
40s	37 @41	80s	65 @67

Southern Frame Spun Yarn on Cones.

8s	19½ @20	20s	22½ @23½
10s	20 @21	22s	23 @23½
12s	20½ @21½	24s	23½ @24
14s	21 @22	26s	24 @24½
16s	21½ @22	30s	25½ @26½
18s	22 @23		

Northern Mule Spun Carded Yarn on Cones.

4s to 8s	21 @21½	20s	24½
10s	22	22s	25
12s	22½	24s	25½
14s	23	26s	26
16s	23½	30s	27
18s	24	40s	32½ @33

Northern Mule Spun Combed Peeler Yarn on Cones.

10s	27	22s	30½ @31
12s	27½	24s	31 @31½
14s	28	26s	32 @32½
16s	28½	30s	35 @35½
18s	29	36s	37 @38
20s	30 @30½	40s	38 @40

THE KNIT GOODS MARKET.

The entire knitting trade is looking forward expectantly to the annual reunion of the "Happy Family," as the National Association of Hosiery & Underwear Manufacturers is termed by its membership. This convention and exposition occurs from May 11th to 15th, and will undoubtedly assume record breaking proportions both in numbers in attendance and also in the number of exhibits made. C. B. Carter, the enterprising secretary-treasurer of the association, has been working with his usual enterprise, assisted by his corps of able attendants and he reports every indication for another large annual gathering.

While the knit goods market during the past month has remained, to a large extent, unchanged, some knitters were feeling a bit depressed and there are numerous complaints received because of disappointing advance orders. In several important cases of hosiery, both in cotton and silk, there is a continuing slowness in advance orders that is plainly disquieting to the mills and their agents. Some agents claim that it is apparent that a large number of the jobbers are figuring on doing better than domestic prices by buying into the foreign market. On the other hand, the jobbers have been sending in reports indicating that their advance for business has not been up to the mark and there are some requests on hand for cancellation. They conclude that retailers are not only holding off on seasonable purchases, but are also backward in giving advance orders for next fall. This applies particularly to underwear, although several large hosiery mills, making a general line of cotton goods, are reported to be closely caught up on delivery. However, the advance business is ample in the very cheap goods, such as misses hosiery and also half-hose. Bundle goods have also been well ordered.

Some underwear agents are confident that the only trouble with the market is the weather, particularly in regard to light weight goods. With warm weather, they believe that the retailers will move goods and the effort will soon be noted by the first hands. Some agents even go so far as to predict a scarcity of the cheaper qualities of summer underwear when the retail trade is fairly underway. They base these views on the satisfactory cleanup by jobbers and retailers of last season's stock and the conservative buying has been the rule for the entire past season.

Agents for sweater coat lines are still waiting for buyers to show more interest, and a number of mills are reported to be beginning to feel this condition. An agent for a foreign line of knit goods who has recently returned from a western trip, reports buyers in the retail trade are operating very slowly for fall, many of them having carried over larger stocks than usual of the heavy goods, such as underwear, hosiery and wool gloves. Recent information received by representatives in the New York market of a German hosiery mill states that business on fine gage goods has not been up to expectations and that prices in consequence are somewhat easier. Unfavorable weather, it was reported has interfered with the sale of light weight hosiery and the additional machinery recently installed in the German mills for this class of goods was to a large extent not occupied.

Taken altogether the situation as to the immediate season's business is not up to the average. It is very noticeable, however, that a considerable part of the trade believes jobbers are over-conservative and inclined to discount the future in too strong a way. Real summer weather is probably what is needed to bring out a normal demand. Silk hosiery for women's wear is more popular than ever, owing to the prevailing fashions in women's costumes, with the slightly split skirts, calling for especially colored silk hose. There has been a heavy demand for goods which retail at 50 cents a pair and a large business has been put through on those even below the 50 cent mark, where goods of this sort has been available. Considerable silk hosiery to retail at prices up to $1.00 a pair has been sold, but beyond this figure the demand has been more or less restricted.

These conditions will undoubtedly be fully discussed at the various sub-association meetings of the National Association of Hosiery & Underwear Manufacturers in their convention at Philadelphia. After discussing these conditions fully and comparing conditions from different sections of the country, a better feeling may be created througout the entire industry. As noted last month, many of these manufacturers indicate that their orders are well up to normal and in many cases ahead, and the large majority of them are looking forward to what they believe will be a good year, taken all in all.

ONE SOURCE OF WASTE.

There are mills which have no supply room in charge of a storekeeper, on the supposition that a storekeeper is an added expense. That this is untrue, those who have tried both ways know. Where there is a supply room the overseers are required to requisition all supplies and machine parts. This enables the storekeeper to estimate what amounts of supplies will be needed for any period. It also enables him to keep a record from which the manager can determine the machines that are the most efficient, or which machines are the most efficiently operated. In fact, if a knowledge of the detailed repair costs per department or branch is desired, a storekeeper is a necessity.

It is no reflection on the purchasing agent to say that too many supplies and machine parts are often bought owing to the absence of a supply room. When an overseer notifies the purchasing agent that anything is needed in his department, the storekeeper is in a position to tell him if the last shipment has been used and how. Also, the storekeeper can keep him informed when any supplies or parts are running low. This often means the difference between express and freight charges.

At a plant of any size it will sometimes occur that materials of a different make, but of the same class, should be used up. This will not be accomplished in many cases unless there is a supply room. It enables the purchasing agent to tell what odds and ends are to be used up. Supplies properly taken care of and distributed are the means of giving the management the value of its money spent in purchasing.

One of the biggest points in favor of a supply room is its feature of enabling the management to keep a perpetual inventory. As a rule, the amount saved in materials and machine parts by means of the supply room will more than pay for the storekeeper. Most any mill man can recall when, at some inventory time, he discovered supplies and machine parts that could have been used instead of buying others. Unless there is a storekeeper, such things will ac-

cumulate in obscure places, where they remain unnoticed until the time comes for stock-taking. Even at inventory time they may be overlooked if they appear on the inventory as "Odds." Then, when discovered, they frequently have deteriorated to such an extent as to become a total loss.

COTTON MANUFACTURING.

THE DESIGN AND MANUFACTURE OF SHIRTING FABRICS.

BY WEBEREI.

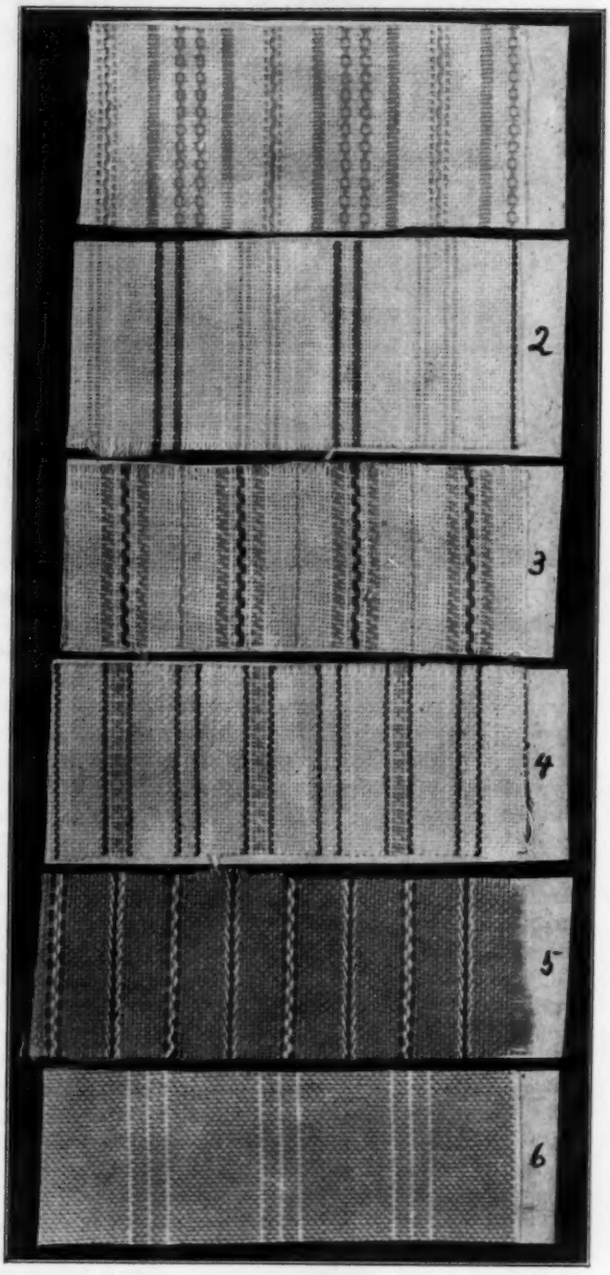
The manufacture of shirting fabrics of various classes can be carried out in any mill equipped for the production of fancy colored goods with some degree of profit if the management is on the alert to the opportunities of the market. Looms fitted with dobbies and heddle motions for say eight lifts, that can equally be turned onto plain goods if necessary, are required if all classes of fancy and colored shirtings are to be produced along with suitable preparation machinery for colored and striped warps. Given these conditions, then all classes of shirtings including oxfords, harvards, sateens and zephyrs (plain and fancy) may be produced with advantage. In the first place a general resume of the style, make and class of design will be given.

Oxford Shirtings. This is a class of shirting which has had a good run on the market for a number of years. The cloth is of medium weight and the designs are made in both stripes and checks. Practically the cloth is plain but the warp threads are run in pairs or tapes and so are often termed double warp oxfords. Very low qualities are sometimes made with single warp or single thread designs. The face of the cloth has a matt appearance on account of the double warp used and being shot with coarse weft in plain cloth order. Small stripes generally of sky blue are common. In some cases stitches of 2 x 2 are introduced to give a little variety and the warp threads are in such cases crammed in the reed to emphasize the effect. In the main, however, oxfords depend for their ornamentation upon the color stripings. In a number of cases only the white ground will be in double warp or tapes and the colored threads arranged in singles to give a fuller color effect. Sometimes thick cords of 2/20's will be introduced to give texture and even fancy weaves in the colored stripes have met with favor during recent years. Figs. 1 to 4 show typical samples of oxfords both in style and coloring. Fig. 1 shows how stitches are used to give variety and illustrates the colored stripe in singles; it is in sky blue and white. Fig. 2 is in black and pink; Fig. 3 is in sky and dark blue; and Fig. 4 in sky blue and sage green. The following weaving particulars are standard makes:

A (Medium quality).
48 picks per inch of 20's filling.
60 ends per inch of 24's warp.
Width 28 inches.

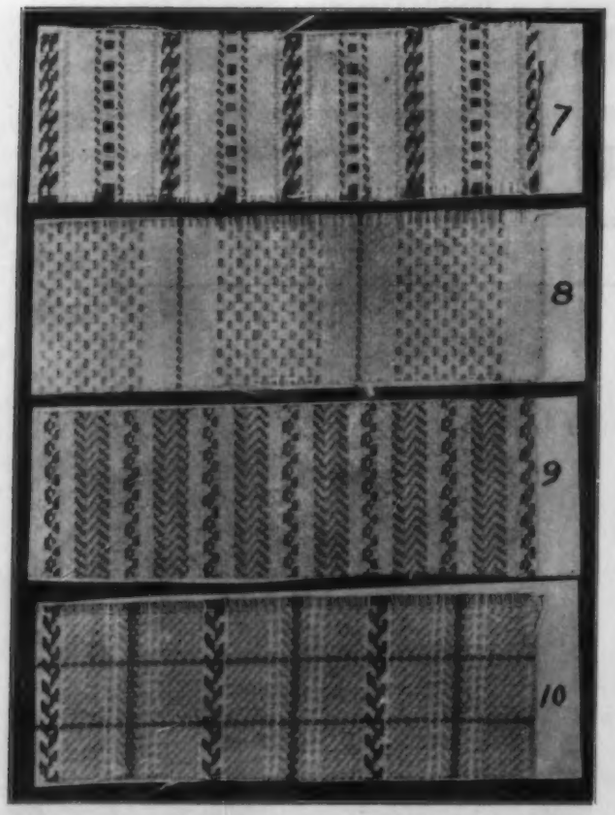
B (Better quality).
80 ends per inch of 30's warp.
40 picks per inch of 10's white filling.
Width 28 to 30 inches.

Figs. 5 and 6 illustrate a colored type of oxford generally termed "sky oxfords." Fig. 5 is made to particulars A



with sky blue weft, but Fig. 6 is a higher quality and is made with white weft. Some of the solid ground colored oxfords are very successful sellers.

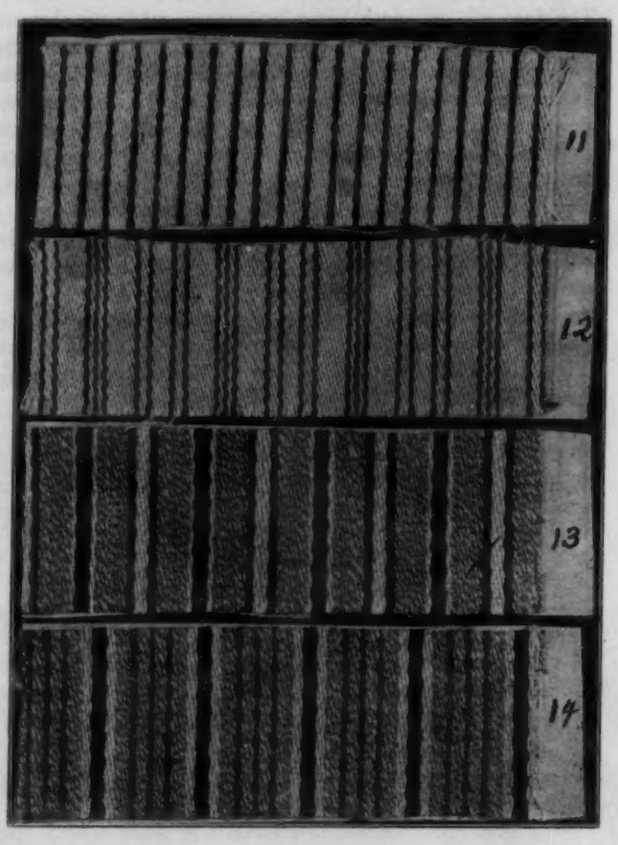
Harvard Shirtings. The cheaper class of oxford shirt has run the harvard a very close race in the selling market of late years. As its name implies the harvard shirt has a base weave of the 2 x 2 twill, and colored stripes generally arranged to give sound figured effect are used as ornamentation. The most successful fancy effects are, however,

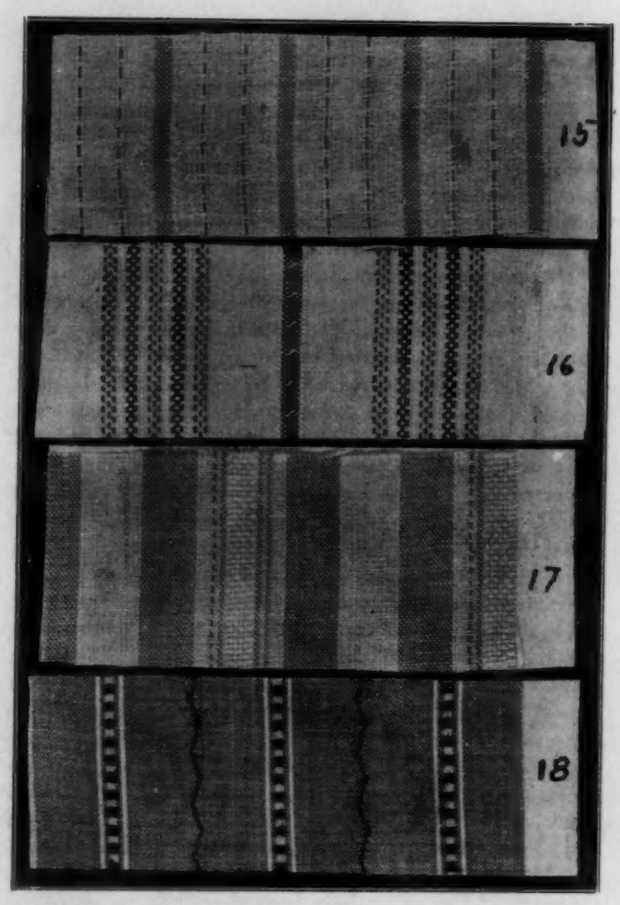


those requiring the least number of heddles and patterns requiring from six to eight are, in the hands of a skilful designer useful styles. Stitch effects of various kinds are greatly used though in most ranges of patterns a few carrying eight-end figure effects are generally found. These figure effects are designed to be filling effects as usually the filling is coarse in count and so more effective than warp effects. The main feature, the twill ground, can however, be used to good effect. The color schemes are varied, some dark and some light, but generally white grounds with sky or blue threads grouped in stripings are commonest. Check harvards are also made but are not nearly so much in demand as the plain striping pattern. The build of harvards varies considerably. A good cloth will have 60 threads per inch of 20's warp and 60 picks per inch of 16's filling; this latter of a good white rove yarn. In lower qualities grey weft is often met with, but it is of good color. Figs. 7 to 10 show some characteristic styles. In Fig. 7 a 4 x 4 red stitch is prominent along with a 4 x 4 twill effect in dark blue as a main effect. In Fig. 8 a pink 4 x 4 stitch is very effective whilst in Fig. 9 the reversal of the twill is made use of. Fig. 10 shows a simple check on a sky blue ground.

Sateen Shirtings. Both the class of shirtings mentioned differ materially from sateen shirtings which are much heavier and coarser in character and are produced for a different market. These shirtings are warp faced cloths, woven with coarse filling to give weight and bulk. The style of pattern in all cases is a stripe of colors arranged either on a white ground as in Figs 11 and 12 or on a black and white ground as in Figs. 13 and 14. The former are light satteen shirtings and the latter "grandrill" shirtings so named from the twofold blue and white yarn used as ground. This twofold warp faced cloth is built for heavy wear and is very successful The stripings are of white, red, sky and blue and since the design is limited to five shafts, color schemes are the only feature. Fig. 11 is a standard style and is made with all red stripes, all blue, all sky, red and blue, sky and blue, and the changes are rung pretty often in this simple pattern. Fig. 12 shows how the stripes can be arranged to give a little variety. The making of these cloths generally follows those given herewith: 100 ends per inch of 20's warp. 60 picks per inch of 14's filling. In the darker styles bright looking patterns are essential but sparing use must be made of white. In Fig. 13 only dark blue and white are used, but in Fig. 14 the central stripe is red. A common make is as follows: 90 ends per inch of 2/40's. 36 picks per inch of 8's filling.

Zephyr Shirtings. These embrace such a wide range that only the simple styles will be dealt with here. A zephyr is essentially a plain light weight cloth, but zephyr shirtings have fancy effects, cords, extra warp and other effects introduced to give variety. Like other shirtings, they are made in both light and dark styles, and of late the wholly colored ground has been favorably received. At one time only light colors could be sold, but now practically any class may be placed upon the market without fear as to some sale, *i. e.* provided prevailing fashions are duly observed. Fig. 15 is a simple light style having a stitch effect introduced that is fairly effective owing to the denting. The ground weave is also varied by weaving some of the threads 2 x 2. Fig. 16 also shows the use of stitch effects whilst a simple figure effect is also introduced. Fig. 17 is a heavy color style whilst Fig. 18 has a neat extra warp effect introduced. The weaving particulars of zephyrs vary considerably. From 60 to 100 warp threads per inch of from 36's to 50's warp may be used and picks in due proportion. Possibly it may be the editors pleasure at a





later date to enable the writer to give detailed particulars of the designs, etc., of some typical fancy zephyrs that would form good guides.

[Note: All readers interested in having further articles of this nature appear in this department will confer a favor upon us by writing the editor a letter expressing such a desire.—Editor.]

CHARACTER OR SPINNING QUALITY OF COTTON.

BY JAMES G. COMAN.

In addition to grade and staple the value of cotton is very largely dependant upon what is known as its character, and under this heading the following points will be considered: strength, evenness in length and in diameter, diameter or fineness, flexibility, elasticity, drag and body.

Strength. The tensile strength of the fiber contributes to the strength of the yarn produced from it and should be carefully considered when purchasing cotton. However, this point is not so important as many commonly suppose and must be considered in conjunction with the length and convolutions of the fibers. Ordinarily, those varieties of cotton having the thickest fibers are strongest and careful tests have shown Indian cotton to be strongest, followed by Orleans, Brazilian, Egyptian, Uplands, Mobile and Sea Island, in the order named. This would indicate that the strongest yarns should be made from Indian cotton, but due to its short length and small number of convolutions, such is not the case. Using general terms, the breaking strength of warp yarns made from ½ to ¾ inch staple represents about 40 per cent of the total indiivdual breaking strength of the fibers composing its cross section; those made from ⅞ to 1 inch staple about 50 per cent; combed 1⅛ to 1¼ inch staple about 60 per cent; combed 1⅜ to 1½ inch staple about 75 per cent; and that from combed 1⅝ to 2¼ inch staple, about 75 to 95 per cent.

To determine the strength of the fibers in a sample of cotton, first pull staple and then grasp the pull between the thumb and forefinger of each hand and break the fibers. With much practice and by using the same number of fibers each time for testing, one can soon become expert enough to determine whether or not the fibers in a sample are weaker than the average. Care must be taken in making a break to have the strain come as nearly the center of the fibers as possible because the fibers are weaker near the end than in the portion close to the seed.

The fiber strength is influenced by the degree of maturity; fully mature fibers being stronger than unripe ones. Immature fibers may be caused by very hot dry weather for an extended period of time, or by disease, or by picking and ginning the cotton immediately after the boll opens. Moisture also affects the strength of the fibers and is one reason given by ginners in Egypt for the practice of wetting Egyptian cotton as it is being baled. Exposure to stormy weather in the open bolls or after the cotton has been baled weakens the fibers as it allows them to remain in a damp condition in which they are attacked by mildew and rot. The type of bagging used affects baled cotton. Closely woven bagging, as sugar sacking, swells on becoming wet and retains moisture by preventing the circulation of the air through the bale. Many farmers do not realize this and use any kind of bagging they can buy cheap, and also allow the bales to remain exposed to the weather, sometimes all winter.

Length. Almost as important as strength is uniformity in length of staple. Lack of this quality means excessive waste, uneven yarns and loss of production to the manufacturer. Tests by Dr. Bowman and others show that Egyptian cotton has the least variation in length followed by Indian, Orleans, Brazilian and Sea Island. Commercially, the per cent of short fibers removed from the different varieties and species is about as follows: Indian and Uplands, 4 to 7 per cent; Gulf, 6 to 9 per cent; Egyptian, 8 to 15 per cent; and Sea Island, 15 to 25 per cent. Unevenness in length in the Gulf cottons has been largely increased by the introduction of short staple early maturing varieties of cotton in the boll weevil infected districts. Cross fertilization by bees and other insects, reversions of type, careless ginning, etc., tend to mix the varieties of cotton and only by the adoption of one variety by all the farmers in one section can the character of the fibers be brought to the highest development.

Diameter. The variation in regard to diameter is much greater than in regard to length, Egyptian cotton having about the least variation, 20 per cent, and Sea Island the greatest, 55 per cent. Average diameters are about as follows: Uplands, Orleans and Texas, 1/132 inch; Sea Island, 1/157 inch; Egyptian, 1/140 inch; Brazilian, 1/127 inch; Indian, 1/120 inch. Irregularity in diameter affects the evenness of the yarn and should be borne in mind when purchasing cotton for mixing. From the figures given it would be unwise to mix Indian with Sea Island or Egyptian even though they were of the same length and character otherwise.

Small diameters usually mean a soft smooth fiber, this being especially true of Sea Island and Egyptian cotton. Softness is especially desirable for hosiery yarns, and this quality and length of staple render the above cottons very desirable for knit goods. Again, the diameter is a good indication of the number of convolutions in the fiber, the fine fibers having a much greater number than the coarse.

Flexibility and Elasticity. Both are very important characteristics of the cotton fiber, the lack of which would render them valueless. Without these qualities it would be practically impossible to twist the fibers together and when twisted, the yarn would break easily under the strain of weaving. Much of the elasticity is removed from the fiber in the preparatory processes even under the most favorable conditions, and it is very necessary for the manufacturer to use every precaution, such as correct speeds, settings, working parts of the machines in the best condition, and use endless other little precautions, to keep this important characteristic in the fiber, as yarn lacking elasticity can soon ruin a mill.

Flexibility allows the fibers to wrap around each other without breaking or cracking. Both characteristics are due to the coating of cotton wax on and the moisture in the fiber. The wax helps to keep the fibers soft and pliable and to reduce the resistance offered by them to being pulled out past each other in the attenuating processes. This resistance generates electricity which causes the fibers to adhere to the rolls, an excessive amount of fly, fuzzy and uneven yarns. The absence of this wax is observed in nearly all cotton grown in a hot, dry climate and is the principle cause of the harsh feeling of such cotton. The effect of harsh cotton is very noticeable in the wear of the working parts of the machines, beaters wearing round more quickly, cards having to be ground oftener, the flutes and other parts of the various machines with which the harsh cotton comes into contact, wearing more rapidly than when running cotton having a good coating of wax. Dyed and bleached cotton frequently has to have oil put on it to enable it to be run, the oil taking the place of the wax removed, in the dyeing and bleaching processes. Improper card settings will remove the wax from the fibers causing them to give trouble in the following processes. Lack of moisture will produce almost the same results and for this reason, the proper amount of moisture should be kept in the air of the different rooms of the mill.

American cottons, excepting those from Texas, Egyptian cotton and some Brazilian varieties are soft. Texas, Peruvian, Brazilian, Indian and Chinese cottons are generally harsh and wiry.

Drag. This is a term used to indicate the resistance offered by the fibers in being drawn past each other. Drag varies with the length, convolutions and roughness of the fibers and by it experienced classers judge the length and character of the sample. It is observed when making a break for pulling staple.

Body. Body is closely related to drag and to diameter and is used to indicate the feeling of heaviness or weight of the cotton. Benders possess this quality in particular and cotton having good body generally has all the characteristics necessary for good spinning. Light, fluffy cotton lacking this characteristic usually comes from poor soil, yields a higher percentage of waste and does not give as smooth, even yarns.

Waste. The nature, causes and to some extent, the losses due to waste have been referred to under previous headings. It is one of the principal points considered by the manufacturer in determining his bid on a lot of cotton. The subject has not been investigated as thoroughly as its importance would warrant and accurate tests determining the waste in the various grades and classes of cotton would be of great value to the trade. Such tests would give a fair basis on which the prices could be established. At present guess work plays a large part in the prices for the different grades.

The amount of waste depends on the grade and character of the cotton, and the amount removed on the quality of the product desired. The following percentages give about the amounts removed in the production of the lowest and highest grade yarns made from white upland cotton of good character and exclusive of bagging and ties: Middling fair, 4 to 10 per cent; good middling, 5 to 12 per cent; middling, 6 to 13½ per cent; low middling, 6 to 15 per cent; good ordinary, 8 to 17 per cent; ordinary, 9 to 18½ per cent. Cotton of poor character and irregular grades will show higher percentages of waste than the above in the production of good quality yarns.

As regards trash, sand and dust, the greater part of this could be removed from the cotton in the ginning process and would be if the farmer could be guaranteed a proportionately better price for his cotton. With the present methods of buying and selling, the farmer with low grade cotton frequently receives as high prices per pound as the one with high grades. This results in the farmers being unwilling to have the waste removed. Several inventions which successfully clean the cotton have been put on the market, but due to the farmers' lack of interest have met with little success. Methods of improving the character of the cotton have been previously indicated.

Waste removed from the cotton in the manufacturing processes is not all a dead loss to the manufacturer. Some of it he can rework unless manufacturing high grade or fine yarns and for the remainder he can usually secure from 10 per cent to the full price of middling cotton, depending upon its nature, sweepings ordinarily bringing the lowest and hard waste the highest prices. The uses for waste are many, some of which are in the manufacture of denims, osnaburgs, sheetings, towels, trouserings, hammocks, shirtings, rope, batting, hosiery, paper, artificial silk, etc.

DESIGNS FOR FANCY COTTON FABRICS.

BY THOMAS WOODHOUSE AND JAMES IRELAND.

Three fancy striped cloths are photographically reproduced at B, C and D in Fig. 42. The only part in B that calls for special mention is the stripe E, the design for which is represented by the corresponding mark E in design F, Fig. 43. This stripe embraces, as shown, 22 threads, the blue threads being represented by solid marks. Although the construction is very simple, it illustrates a method of obtaining a very pleasing effect. Each repeat of the warp consists of:

White	20	2	2	2	2	2	40	20	= 90
Blue		2	2	2	2	2	2		= 12
Black								4	= 4
								Threads per repeat	106

and there are 88 threads and 48 picks per inch. Although

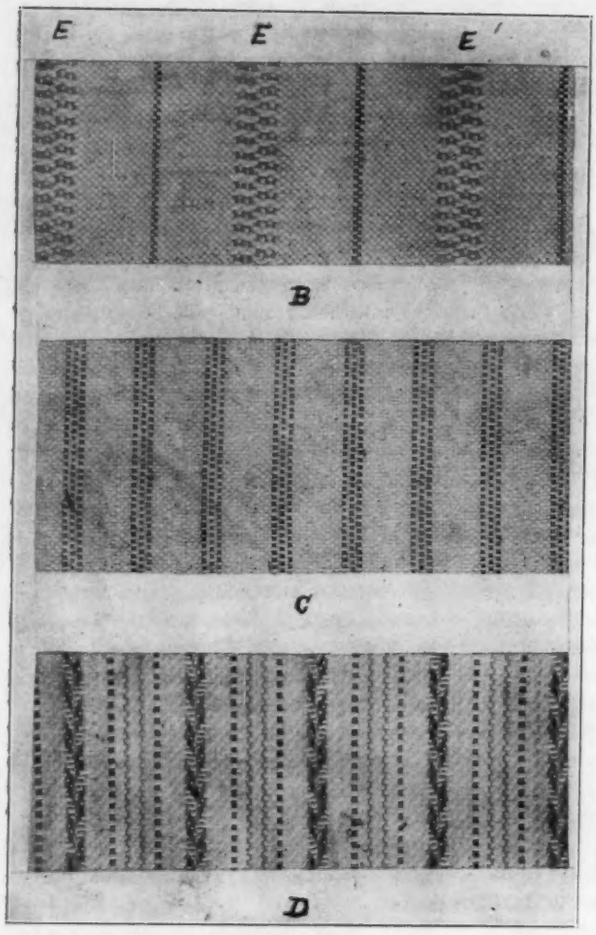


FIG. 42.

the weaving plan G, Fig. 43, differs a little from that shown at V, Fig. 40, either may be utilized to weave both patterns.

When the warp and weft threads of any particular part of a cloth are of the same color, the reproduction of the effect by photographical methods naturally suffers somewhat, and the white stripe in illustration C, Fig. 42,

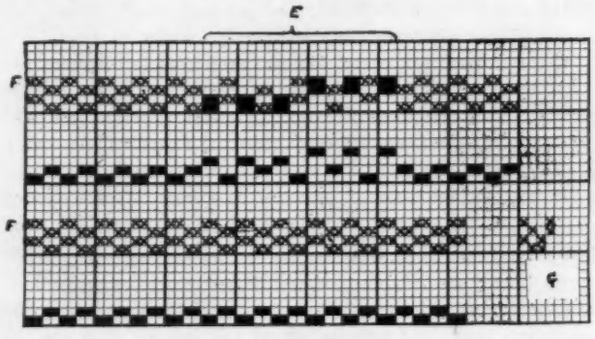


FIG. 43.

is a typical example of this defect. The three narrow bands of black show up quite distinctly, but the central part of the white stripe is much less distinct. The design for this central part is shown at H, in Fig. 44, and is a double warp wave effect on a double warp plain ground. Indeed, all parts of the cloth, with the exception of this wave effect, weave in plain order, either single or double warp, as indicated by the weaving plan K, from which it will be seen that five of the seven harnesses are required for the wave effect and two harnesses for the plain ground. There are 88 threads per inch and 48 picks per inch, and the order of warping is as follows:

White	2	26	2	=	30
Black	1	2	2	1 =	6
					—
Threads per repeat					36

All the threads in this pattern, with the exception of the white ones in the black and white stripe, work in pairs.

A little more ornamentation appears in the cloth which

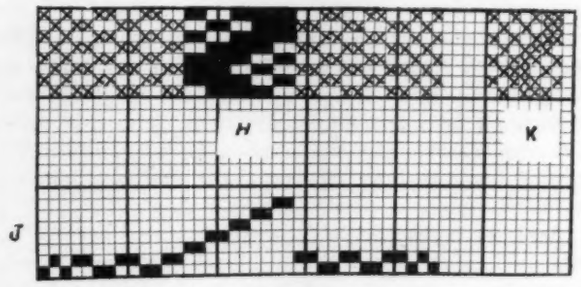


FIG. 44.

is illustrated at D, Fig. 42, although the major portion of the design is developed in rearrangements of the 4 threads which constitute the 2/2 twill. These variations are shown clearly in crosses in the design L, in Fig. 45. Although this is the case, it has been necessary to repeat the 2/2 section four times in the way of the weft, because the feather

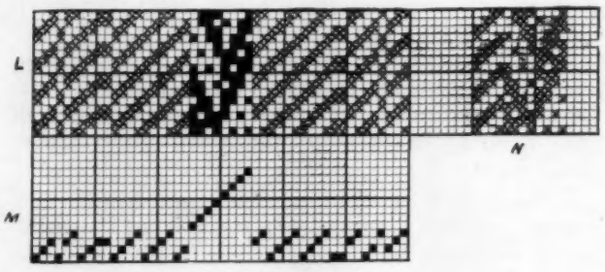


FIG. 45.

stripe requires 16 picks. The threads in the feather stripe are shown in solid marks and require 8 harnesses. Altogether, 12 harnesses are essential for the production of this fabric as illustrated in the draft M and the weaving plan N. There are 68 threads per inch and 64 picks per inch of white filling, while the warping arrangement is indicated below:

White	2	4	10			10	4	2	=	32
Light Blue		2		1	2	1		2	=	8
Dark Blue			2		2	2	2		=	8
										—
Threads per repeat										48

(To Be Continued)

Professor (to inattentive student)—"Mr. Blank, you may tell us something of the occurrence of $CaCO_3$ in nature."

Student—"Why—why, it is very rare, sir."

Professor—"Very good. Sit down. You neglected to state that the Appalachian Mountains are composed of this rare substance."

FIGURED TURKISH TOWELS.

BY F. W. HORROCKS.

The Terry type of fabric is certainly one of the most useful the cotton manufacturer produces. These cloths are used as hand towels, roller towels, bathing towels, bath mats, and for quite a number of other sanitary purposes. Sometimes a linen pile warp is used along with a cotton ground warp in the weaving of scrubbing cloths for horses, etc. In this case the ground warp is dyed the same color as the linen, or, if a better cloth is required, the ground warp may be of linen also. Soft Terry cloths are now being made with very soft yarn, generally known in England as "weft yarn," for the pile warp. These last mentioned cloths, though appreciated for their cheapness and softness, are not very durable. Owing to the extreme price of cotton, the manufacturer occasionally experiments with artificial fibers, such as cellulose, paper, and anything else to provide for the material of the pile warp.

As a by no means careful examination of a piece of Terry cloth will show, there is a great difference between the amount of yarn required for a ground warp and that required for a pile warp; the manager has to take care that the exact proportion of pile to ground is being woven; otherwise he may find himself two or three warps short to complete an order. This proportion of pile to ground varies from 3 to 1 for the most lightly picked cloths, to 10 to 1 for the best sorts.

Many towels for public institutions, such as baths, hospitals, etc., for hotels, steamships and works, are distinguished by having the name of the baths, hotel or ship woven into the towel in stripes running up the center of the cloth. For instance, when we see a towel with a white stripe up the middle and a series of letters in red on this stripe forming the words "Stolen from John Smith's baths," we have a very good idea as to who the owner is.

These lettered centers, for their weaving, require a jacquard machine, a dobby being required for the operation of the healds for the rest of the cloth. Each letter requires a certain number of cards for itself, some cards also being required for the spaces between the letters, and more cards for the spaces between the words and at the ends of the towel. It was formerly thought necessary to have a separate card for each pick of the loom. Now, however, we use a jacquard, which requires only one card for three picks of the loom. This is a double-lift, single cylinder machine, in which the hooks are pressed on to the knives or griffes by the blank in the card, instead of as in the usual way of the blank pressing the hooks back away from the knives. The card is kept pressed against the lances or needles all the time required for the selection of the hooks for three picks, the cylinder being pulled away from the lance board and turned and pressed forward to the lances in time to select the hooks for the next three picks. It will be seen, therefore, that there is very little time allowed for the cylinder mechanism to act, and, in fact, this forms the weakest part of a very ingenious arrangement.

The shedding of the jacquard machine may be performed by any of the ordinary methods, such as two long rods from the lower shaft of the loom operating two lifting cams over the jacquard machine. The cylinder mechanism, however, being required to operate the cylinder only once every three picks, consists of a box tappet, driven by suitable wheels from the end of the crank shaft of the loom. The beadings on the face of this box tappet lift and depress a friction roller secured by a stud on a lever. To the end of this horizontal lever an upright connecting rod is attached, which operates the cylinder mechanism.

The harness mounting for a letter center towel is but a very small one, generally of from 40 to 100 threads, is sometimes in front of the healds, but this matter is chiefly one of convenience. This harness controls only the ends required to form the pile, the ground ends being operated by the healds and the dobby. Where the red ends are forming the letters on one side of the cloth, the white ends are forming the letters on the other side. The forming of the pile in these cloths, as in ordinary Terry cloths, is caused by the shedding of the ends, the different weighting of the warps, and the beating up of the reed. The most common type of Terry is on three picks to the round, and in which the reed is held fast on the third pick. The ends for the ground form what is practically a plain cloth, and the ends for the pile weave opposite to each other, the face end weaving two picks up, one down, and the back end weaving two picks down, one up. The reed is held firm between the two picks in the same pile shed. The yarn on the ground warp being very heavily weighted, and the yarn on the pile warp being very lightly weighted, the pile yarn is pulled forward along the tight ground yarn when the reed is held rigid on the third pick, and so makes the loops on both sides of the cloth.

The amount or proportion of pile yarn to ground yarn in the cloth is regulated principally by means of the projecting beater attached to a vibrator shaft behind the front breast plate. This beater is depressed for two picks, and so raises the finger secured to the loose reed and causes the reed to fall back about one inch. On the third pick the reed is held firmly by means of the beater being raised and pressing down the finger secured to the loose reed. The amount of pile may also be, to some extent, regulated by means of an alteration in the weighting of the warps. The weaving of Terry cloths is a special branch of the weaving trade, and is never very successful when tried in any ordinary, plain weaving concern.

Chang Chien has wired to the Department of Industries and Commerce that he proposes to establish a model cotton weaving mill at Shanghai, with a capital of 2,000,000 tæls (custom tæl now about 77 cents gold). There will be spinning machinery with 50,000 spindles with an estimated production of 37,500 bales of cotton yarn a year. The weaving machinery will weave 2,000 pieces of cotton cloth per day. Two thousand cotton ginning machines will deal with 10,400 piculs (picul = 133 1-3 pounds) of cotton. The capital of 2,000,000 tæls will be divided into 20,000 shares, and the promoters will hold one-fourth of the same. The rest of the capital, *viz.*, 1,500,000 tæls, will be placed on the market at Shanghai, to be subscribed up to the end of December. Therefore it is asked the said department will grant the company a patent. It is understood that the grant has been duly given by the department.

The question of courtesy is so important and of such mutual benefit that it would seem necessary to obtain full cooperation from every employee.

KNITTING DEPARTMENT.

COST ACCOUNTING IN UNDERWEAR MILLS.

There was a time when the manufacturer of underwear could take a garment made by a competitor and reason thus: "If my competitor can make this garment for so much, I can make it for less money, because I don't think that my expenses are as much," etc. An effort would be made to make a garment just as good or perhaps a little better than the competitor's garment for less money, and the only ground to stand on would be that the maker of the garment in question has been a successful manufacturer and apparently has made money.

The time for such a method of getting at the manufacturing of underwear is without a doubt gone forever. The fixing of the price of a garment by having the salesmen bring it in and say it is what is wanted, and that it should sell for so much, is also in practice, but this method is also becoming crude, as the competition in every line becomes keener each year, and every mill in a country is not equipped to make what every other mill can make.

Every mill should get out its own line of goods made up after some ideas of its own, figure the cost, and put a price on the same according to the found cost and the market.

Strange as it may seem, there are still manufacturers who make goods without paying much attention to the cost accounting. They make the goods at a certain price because somebody else does and trust to luck as to the final outcome at stock-taking time.

A mill might make money on the total production, but there may be some goods very close if not losers. Yet little attention would be paid to this, because the thing, on the whole, appears to pay. Such a mill might be successful for some time, and after a while the sales might change materially from the better standing lines onto the poorer or losing lines, and such a mill would run at a loss unknowingly till stock-taking and then not realize how it happened that a loss had been made.

This no doubt accounts for the fact that some mills seem to run along for years, then after a while peter out because they have been making poor lines, losers, and did not realize it, or else did not have the ability to get out of the rut.

If a more systematic way of ascertaining the cost of the goods manufactured were kept up—that is, a cost accounting which would show the cost of each article manufactured—there would no doubt be much less foolish competition than at present. Should close cost accounting be put into operation in some mills, it might be found that they had been pushing sales on poor or even losing lines.

Sometimes mills seem to think that if they can only get a large production, all the trouble will be overcome. So they get out garments at prices to catch the business, thinking that through a larger production they will be enabled to sell on closer margins. This may be true at times, but it does not always work out that way; so they find that the larger production does not increase that much-sought-after profit, but leaves them only with the name of doing a whopper of a business.

Larger production may decrease the cost of manufacturing on certain goods, but when production is carried on in a general way by making any assortment of lines, simply with a view to getting production and trusting to luck as to the final outcome, the problem then becomes greater and is further from solution than ever.

Cost accounting has developed into a science, and where a great many lines are manufactured it is sometimes very difficult to establish a permanent system on a definite basis. In practice it is a method of bookkeeping arranged to suit the requirements of the class which is being manufactured.

The elements of cost finding we can outline in a general way as follows: (1) Material; (2) labor; (3) flexible charges; (4) fixed charges; (5) executive and selling.

In general, the fixed charges are thought of as something stationary, and flexible charges as something not so easily located, but, after all, it is very vague to say that any charge is a fixed one.

The variation in production from day to day, and during different periods of the year, certainly makes a great difference in the cost of the goods. The system of finding the cost of each article manufactured should be kept up at all times, and it would be found that changes in the different charges placed against the article would need to be made from time to time until certain charges could be determined quite accurately.

A garment to start with might show a good margin, but the construction may be against it; for instance, in the way the yarns are run so causing an undue amount of seconds and waste which never had been thought of or figured on when the garment was laid out. And, similarly, a garment which on the face of it would show a close margin might prove to be no closer than the one which at first sight had the appearance of being a profitable one.

We can now see the difficulty confronting anyone endeavoring to accurately place the cost of any garment. The fact is that all charges can be said to be flexible, and it would require some facts, figures and experience to arrive at accurate results.

In starting such a system, average production would have to be taken as a basis. The different lines being closely estimated can be tested by obtaining accurate reports from the different departments as to the materials used and the amount of production for fixed periods. The labor expended must be charged against each line of goods made and can be checked up by keeping the payroll for each department separate. By getting the average cost and the average production from accurate tests and specific cases, a basis for a system may be laid, preserving all the information necessary. This can be later drawn up in statistical form and thus form the basis of future calculation.

Estimates of the cost of manufacturing should be based on the actual cost of production; that is, after a mill is started and getting off an average production. To base cost on an assumed production which is never reached can

be seen to be a false premise. At the same time, if the cost is based on an entirely too small production, the figured cost of the goods manufactured would show the cost too high for competition, especially where goods are made on close margin.

We will endeavor to show how a cost system can be laid out and used which will show whether the goods are manufactured within the allowed cost or figures used, or rather a system which will show the actual cost of production in the different departments. In order to do this, it will be necessary, first of all, to keep account of all materials and supplies given out and used, and a record of the daily reports of production in the different departments. If the mill makes part of the yarns used, the cost of the yarn laid down in the knitting room should be shown. That is, a separate estimate should be made when the yarn is made in the mill, this yarn to be delivered at a price which is the same as yarn invoiced from outside. All materials and supplies given out and used should be charged to the various departments. The floor space and power used by each department should be charged proportionately. All repairs, including materials and labor required, should be charged to the different departments.

Should the cost of maintaining the mill—that is, the interest, taxes, power, repairs, etc.—all be figured and charged equally on every dozen manufactured, as we know some manufacturers do, this certainly would not show very accurately the cost of the various kinds of goods made. For this same reason all incoming freight, express and cartage should be charged or added to the invoice or cost of goods received. In this way the actual cost of materials and supplies would be shown and figured where it belongs.

Some mills use a level figure to cover all overhead charges. This also is misleading. For instance, should the mill make a kind of goods on which there is much labor, and again another kind of goods which does not require nearly as much time to produce, and should sales increase on the kind on which there is the most labor, the production would drop, and consequently the figure allowed for overhead charges would not be sufficient. On the other hand, should the easier kind sell better, the overhead charges would prove to be too high. The cost of maintaining the dye house—that is, the interest on the cost of the building, or its portion of building if not separate—the proportion of taxes, insurance, water tax; the repairs, including both the materials used and the labor required; the power, and the amount of coal consumed for the steam used—all should be charged to this department. We can readily see that to keep a general account of interest, insurance, taxes, water, coal, repairs, express, freight and other various items, and then charge to the garment, would not show the cost at all, because the goods which never went to the dye house would be charged a portion of the items of the expense mentioned. This, of course, would show a less cost per pound of goods going through the dye house, and the goods which never went there at all would have to stand part of the cost of goods which did go through this department.

The following is a good example of the departmental cost accounting system. A systematic accounting each day of the work done in the different departments would, of course, be necessary. Printed forms should be filled out each day covering in detail the information needed from the different departments. If the mill makes its own yarn, or part of it, the sheet from the card room should show the amount of the different kinds of stock taken in and used daily, and also should show the amount of the waste made at different given points, in order to indicate the shrinkage from the original amount of stock taken in. If clips be used, the number of pounds put through the picker and garnet machine should be reported daily, and labor and all other expenses charged against the amount of work put through in order to show the actual cost of this material. The formed cost of this kind of stock, then, should be used as the cost of raw material or stock to be charged out when used the same as other stock.

The report sheet for the spinning room should show the production from each machine and the waste made.

The yarn as it is being taken into the knitting room should be charged out the same whether it be yarn from the spinning room or yarn bought.

The knitting room report form, the best we know of, shows the number of pounds and kind or style of cloth taken off each machine daily. This report sheet has the number of the machine, the cylinder inches, and space to mark each cut-off. In practice it is found that three spaces are necessary. This form not only shows the production taken off each machine, but it also would serve as a reminder to the one in charge if the machine should be standing because of want of an order for knitting. All supplies given out to the knitting room should be charged as supplies, and the needles should be kept track of as a separate account, as this is sometimes quite an item and very often needs more attention.

The bleach or dye house daily report sheet should be made up in such a way that not only the style of cloth put through, but also the size of the cylinder is shown, thus keeping track of the kind and size going through, in order to locate the work required. Thus this sheet would serve a two-fold purpose.

The amount of waste in the cutting room is a large item. In some mills it is the custom to show the weight of each roll before cutting, the number of dozen cuts, and waste made. This may be all right in some mills, but to do this correctly consumes some time, and is not practical, especially where help is scarce. To have a system is all right, but to be of real value the red tape wants to be cut out of it as much as possible, because where the red tape begins is just the place where any system commences to lose the result aimed at. To know where the thing is at—that is, to know whether the goods are kept to weight, and the waste is not running over the figured legitimate amount—the cutting room daily report will be made up so as to show the number of dozens cut of each style, whether vests, pants, shirts, drawers or union suits. Having once ascertained the legitimate amount of waste, it is a very easy matter each morning to see whether the waste has run over or not by taking the number of dozens cut of each kind and style, and the amount of waste of each kind, or even the total amount reported. It is also necessary to weigh at least a garment out of every roll. These weights should be taken off the cutters' individual slips and entered on a report sheet and turned into the office daily.

To figure the cost per pound of the cloth delivered to the cutting table is the most satisfactory method. The cost

of producing a pound of yarn has been ascertained by charging out all supplies and materials, by keeping the payroll separate and the labor charged to each department and process on the way, and by charging the floor space, power, etc., when charging out the materials and supplies. The freight, express and cartage were taken care of in their proper place, for these charges were added to the cost of the different items when they were taken into the mill. Every item of expense connected with this end of it should be taken care of and shown, no matter how small, thus showing the actual cost of the yarn delivered to the knitter. A sheet showing the cost of the cloth delivered to the cutting room can be used to advantage and will save time, especially where more than one style of goods is made out of the same cloth.

This sheet would show the kinds of yarn used and the percentage of each when more than one kind is run in. The knitting supplies, the needles and the labor are all based on the daily production in pounds. This having been found through the method of charging out the supplies, needles and labor as against the number of pounds knit daily, it is tabulated for each period of one, two or more weeks, suiting the requirements. This sheet also would show the items of dye house supplies, materials, labor, etc., all based on the production in pounds of cloth as per the daily report sheets. It would also show the percentage of shrinkage made from the yarn to the knitted cloth ready to cut. This shrinkage would be the waste made in the winding and knitting of the yarn into cloth, the shrinkage made in bleaching or dyeing, as the case might be, and also the napping or brushing waste.

We can now readily ascertain what a pound of cloth costs to produce delivered to the cutting department. Should a garment weigh eight pounds per dozen cut, and a half a pound of waste be made in the cutting, we would now require another sheet which would start off with eight and one-half pounds of cloth at so much a pound, the cost per pound of cloth found as per cloth cost sheet.—*Canadian Textile Journal.*

HOSIERY KNITTING.

In the production of a stocking on a knitting machine, a number of intricate problems are presented. Their successful solution has involved a high order of inventive genius. Chief among these problems is the shaping of the stocking to fit the leg and foot of the wearer. Another is the splicing of such portions as are subjected to the most wear in use, and still another is the ornamentation thereof, either by use of a plurality of threads of different colors to produce vertical or horizontal stripes or figures, or by a varaition in the character of the stitch, thereby producing what is technically known as lace or open-work.

One of the types of circular knitters comprises a needle-cylinder, and encircling rotating cam-cylinder, and latched needles with butts, or lateral projections, on their shanks. The needle-cylinder has a series of longitudinal parallel grooves on its outer surface, and the cam-cylinder is provided with suitable cams or inclines on its inner surface. The needles lie in the grooves of the needle-cylinder with their butts projecting outwardly. As the cam-cylinder revolves the butts come in contact with, and slide up and down the inclines or cams, and so cause the requisite up-and-down movement of the needles in the operation of knitting. In knitting the tubular portions of a stocking, all the needles are in operation and knit one course at each revolution of the cam-cylinder.

In knitting the heel or toe of a stocking, only a portion of the needles are in operation, and the cam-cylinder is reciprocated, or moved first in one direction and then in the opposite direction. The heel and toe are in the form of a pouch or pocket, and they are knit by what is known as the narrowing and widening operation. In this operation about one-half of the needles are first raised to a higher level, or into an idle position, so that their butts will not be operated upon by the stitch cams, and the other half of the needles remain in an active position, where their butts may be operated upon by the stitch cams. In the operation of narrowing, which then takes place, one of the active needles is shifted to a higher level, or to the idle series, at each reciprocation of the cam-cylinder, by raising or elevating the butt of the needle. When the narrowing is completed, the widening takes place by exactly the reverse operation; one of the idle needles is shifted to a lower level, or to the active series, at each reciprocation of the cam-cylinder, by lowering or depresing the butt of the needle.

This method of shifting one individual needle as the cam-clinder moves in one direction, and another individual needle as the cam-cylinder moves in the opposite direction, is the generic mode of the operation of knitting the heel or toe of a stocking. There is a modification of this method which is used only in widening. This modification consists in first throwing one needle out of operation, and then throwing two needles into operation on each reciprocation of the cam-cylinder. In other words, it consists in continuing the narrowing operation of carrying one needle out of operation through the widening and in adding two needles to the active series during the widening in place of one. The net result, of course, is the same—namely: that one needle is added to the active series at each reciprocation of the cam-cylinder. This modification, from the point of view of the result accomplished, is also described as throwing two needles into operation as the cam-cylinder moves in one direction, and throwing one of these needles out of operation as the cam-cylinder moves in the opposite direction. To distinguish these two modes of operation, the first is called the "one-and-one method," and the second is called the "two-and-one method."

The two-and-one method is useful for the following reasons: In the one-and-one method the last needle to knit in the widening operation, as the cam-cylinder moves in one direction, is the first needle to knit on the next course on the return reciprocation of the cam-cylinder in the opposite direction. This needle, therefore, draws two loops, with the result that a series of small holes is left along the line or seam where the narrowed and widened portions are joined in the heel or toe pocket. This disadvantage is overcome by the two-and-one method, by which the last needle to knit in a given course is thrown out of operation on the return reciprocation of the cam-cylinder, and therefore it is not the first to knit on the next course. To express the effect in another form, in knitting each course, one needle knits beyond the needle which is the first to knit in the next returning course.

In the earlier machines of this type all the rotary knit-

ting of the body of the stocking was automatic, while the reciprocating knitting of the heel and toe was done by hand. When the rotary knitting was partially or wholly completed, or when the heel or toe were to be knit, the machine was stopped and about one-half the needles shifted to an idle position. In the narrowing and widening operation which followed, the individual needles were raised by a pick or hook in the hand of the operator and depressed by the finger of the operator. As the result of this use of the pick to shift the needle, the term "picker" has come to designate the means by which the needles are shifted in an automatic machine. The pickers which raise the needles are known as elevating or lifting pickers, or lifters, and the pickers which depress the needles as the depressing pickers or droppers. Two lifting pickers are used in automatic reciprocating knitting, one operating when the cam-cylinder moves in one direction and the other when the cam-cylinder moves in the opposite direction; and the same, of course, is true of the depressing pickers. The necessity of having two lifting pickers and two depressing pickers is because there must be two stitch-cam arrangements on the cylinder in reciprocating knitting, one operating when the cylinder is moved in one direction and the other operating when the cylinder is moved in the opposite direction.

When the old picker machine, with the needle raised and depressed by hand during reciprocating knitting, went into extensive commercial use, the efforts of inventors were naturally directed to making the whole machine automatic by devising automatic pickers.

The first automatic picker was invented by Hollen about 1876. This was followed by the Haddan picker of 1881, the Branson picker of 1885, and then the improved Mayo picker of 1887. Following these pioneers in the art is a long line of men through whom the automatic picker has been brought to a state of practical perfection.

In the manufacture of stockings it is desirable that, in order to have them adapt themselves readily to the shape of the leg, the upper portion be somewhat larger than the part covering the foot and ankle, and that the upper and larger portion should merge gradually into the smaller part. In order to accomplish this, when knitting seamless hose on machines adopted for circular knitting, a different mode of procedure must be adopted from that followed when straight-knitting machines are employed.

It has been proposed to knit the entire leg portion of the stocking upon a circular knitting machine having a cylinder of a certain size by making the stitches of the upper portion of the leg considerably longer and looser than those of the lower portion, and then shaping the article on a suitable former. This method, however, leaves the upper portion of the stocking leg more open and loose than the lower portion and less elastic. It has also been proposed to knit the larger portion of the leg first down to a certain part, then to reciprocate the machine and knit a flat-web, narrowing on each selvage edge for a certain distance, then to transfer the article to a smaller cylinder, and, after knitting the remainder of the stocking, to unite the two selvage edges by sewing in any suitable manner.

The machines required to effect this work must both be capable of circular and reciprocating work, and also narrowing and widening, and where automatic machines are used for the foot, they are more costly and need more attention during the periods of operation than machines for knitting plain circular work; hence the work produced by such machines is rendered costly by the expensive mechanism and the expense of skilled operators who are needed to operate them. It will also be seen that the time required to place the half-finished work upon the cylinder of the smaller or foot-forming machine renders the machine inoperative for considerable periods at short intervals, and this necessitates the use of a larger number of machines in order to produce a given quantity of work.

Another plan is to knit the stocking upon a single machine, mainly in plain stitch, but to provide one or more tapering gussets in tuck stitch at the calf of the leg by the use of special tuck wheels. This tuck stitch has also been used to make the tube wider above the ankle portion, the tuck needles being used in alternation with plain needles throughout the circle of the needles. The plain meshes, from their comparative rigidity, serve to prevent the readjustment of the tuck stitches and thus hold the tube to its enlarged diameter.

In an analogous manner, a stocking having a self-contracting garter may be formed by knitting the upper end of the stocking in tuck work, then a narrow band in plain work, thus forming the garter, then resuming the tuck work until the ankle is reached, and finally forming this and the foot in plain work.

Still another expedient is to knit the foot and ankle upon a small machine, then to remove the work and slit the rear of the leg for a short distance from the upper edge. The work is then transferred to a cylinder having a larger number of needles, so that the cut edges are spread apart, and the knitting of the leg is completed. The stocking is then turned inside out and a seam is sewed from the lower end of the slit, in an inclined direction, until it intersects the rear fold of the stocking. This leaves a triangular portion at the base of the larger part of the stocking which must be cut out. This step may be reversed, the triangular portion being cut out first and the seam then run.

Still another plan is to knit the foot portion and ankle upon a machine having, say, eighty needles, and then transfer the work to a machine having, say, one hundred needles, by placing forty stitches upon forty needles at the front of the machine, leaving forty stitches to be distributed over the remaining sixty needles. This is done by dividing the stitches into two groups of twenty each and distributing each group of twenty among thirty needles, skipping every third needle. The unfilled needles are then supplied with stitches from the preceding course. The knitting of the stocking is then completed upon the hundred needles. The advantage of this method is that no pin-holes are left in the stocking at point of transfer.—*The Textile American.*

One striking characteristic of the growth during 1912 in exports to Asia lies in the fact that India and China have followed the example set by Japan some years ago in the purchase of American cotton. Both India and China are producers of raw cotton, India ranking second in the world's cotton-producing countries; yet the exports of raw cotton from the United States to British India in the calendar year 1912 amounted to 35 million pounds, valued at three and three-fourths million dollars, and to China, also a cotton-producing country, the exports of raw cotton in 1912 were 14 million pounds, valued at 1½ million dollars.

Dyeing, Bleaching and Finishing.

THE MANUFACTURE OF ARTIFICIAL SILK FROM COTTON.

BY H. R. CARTER.

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The vast majority of dyes go too quickly onto artificial silk, and the resulting want of uniformity shows itself in the shape of white undyed specks. For many reasons artificial silk shows great want of homogeneity, both as regards chemical composition and structure. It is, therefore, often impossible to dye artificial silk with uniformity with a single dye, and the dyeing usually requires topping with a basic dye to secure uniformity. In this case the hanks are placed, after the first dyeing and rinsing, in a fresh bath prepared for 100 pounds of silk as follows: 300 gallons of soft water and ½ gallon of acetic acid. Dye according to shades. Dye cold or at about 85 degrees F. for about thirty minutes.

The affinity for dyes in the case of artificial silk which has been treated with formaldehyde may be increased by treating the hanks after they have been washed in a solution of caustic soda along with an oxidizing salt, such as hypochlorite of soda. The concentration of the liquor should be about 18 per cent.

Shades which have been dyed too dark may be lightened by a short steaming, while light shades may be darkened by hot drying.

Turkey red oil must not be used with basic colors.

Bleaching may be done with electrolytic hypochlorite or sodium hypochlorite. The strength of the bath should be 1 per cent of available chlorine. In this the hanks are immersed for thirty minutes, rinsed, and soured in a bath of 2½ ounces of sulphuric acid in 10 gallons of water, and then thoroughly washed out. The hanks of silk are then blued in an acetic acid bath with blue. Scroop is best given to silk dyed with substantive dyes by a frothy soap bath, with an addition of Glauber's salt. The most permanent scroop is given by a tartaric acid bath—½ to 1 ounce of tartaric acid to a gallon of water.

Glanzstoff and other similar artificial silks are dyed with the basic colors by first mordanting with tannic acid and tartar emetic. The hanks are entered at 140 degrees F., after adding to the bath 2 to 4 per cent of tannic acid, and preferably ¾ per cent of hydrochloric acid, and are worked for a short time. They are then left in the liquor for two and one-half hours, being turned at intervals. Before being lifted, they are turned again several times, then lifted, hydro-extracted, and after treated for one-half hour in a fresh bath containing 2 per cent of tartar emetic.

The dyeing is carried out with the addition of from 3 to 6 per cent of acetic acid. The hanks are entered at the usual temperature, and the color added in several portions, the liquor being finally warmed up to about 120 degrees F.

The benzo colors are applied to Glanzstoff silk as described for Chardonnet silk, the liquor, however, being heated up to 150 degrees F. for fast scarlet and to 175 degrees F. in order to exhaust the bath better. It is advisable to commence the dyeing of light fashion shades without Glauber's salt, and only to add this after the dyeing has been going on for some time. An addition of soda produces level dyeing, while 3 per cent of monopole soap also aids the shades to turn out even and gives the silk a soft handle.

The application of the direct cotton colors to artificial silk is very simple. Light shades are dyed with the addition of soap and phosphite of soda for three-quarters of an hour at 100 degrees F. Medium shades are dyed with the addition of ¾ per cent of soda ash and from 10 to 15 per cent of Glauber's salt for three-quarters of an hour at 140 degrees F. Dark shades are dyed with 2 per cent soda ash and 25 per cent of Glauber's salt, or common salt, for one hour at 140 degrees F. When dyeing black, the bath is sometimes taken to a still higher temperature. If monopole oil or oleine oil is added to the bath, the silk has a softer handle. When dyeing the chlorazol brilliant blues, no soda ash or oil must be added to the dye bath.

The following methods of after-treatment may be employed to increase the fastness of direct cotton colors: It must be remembered that in every case the shade is more or less altered by the after-treatment. After-treatment with bochromate, copper sulphate and acetic acid considerably increases both the fastness to light and washing of the shades submitted to it. A fresh dye bath is charged with from ½ to 2 per cent of bichromate, ½ to 2 per cent of copper sulphate (bluestone), ½ to 2 per cent of acetic acid. The dyed hanks of silk are worked in this for one-half hour at 120 degrees F.

After-treatment with copper sulphate improves to a remarkable extent the fastness of shades to light, also to some extent to washing. To apply the process, a fresh dye bath is charged with ½ to 3 per cent of copper sulphate, in which the silk is worked for one-half hour at 140 degrees F.

After-treatment with formaldehyde is done in a similar manner and has a marked effect upon the fastness to washing.

The after-treating process of coupling with diazotized paranitraniline has a marked effect upon the fastness to washing and acids of shades submitted to it, while the intensity of the shade is also increased. A fresh dye bath is charged with the requisite quantity of diazotized paranitraniline, soda ash and acetate of soda, in which the silk is worked for one-half hour, cold.

Diazotized paranitraniline may be prepared as follows: Two pounds paranitraniline are stirred into a paste with 3 gallons of hot water. Then 5½ pounds of spirits of salts at 32 degrees Tw. are added and the mixture stirred until the solution goes clear. To this is now slowly added, during continuous stirring, 10 gallons of cold water. This precipitates the hydrochloride of paranitraniline in a fine state of division—the finer the state of division the easier to diazotize. This is allowed to cool, and then 1 pound of nitrate of soda (98 per cent), dissolved in 2 gallons of cold water, is added all at once and the solution stirred until it goes clear. On adding 4½ gallons of water to this solution, one has a 1 per cent solution of diazotized para-

nitraniline, from which any given weight may easily be measured. For every gallon of this solution added to the dye bath add 1¼ ounces of soda ash and ¾ ounce of sodium acetate. Basic colors may be added direct to the coupling bath containing the diazotized paranitraniline, by which means the beauty of the shade may be considerably enhanced.

The process of diazotizing and developing has also a marked effect upon the fastness to washing and acid cross dyeing, while the shade thereby gains considerably in depth. The silk is first dyed in the usual way with direct cotton colors. It is then well washed and worked for twenty minutes, cold, in a dye bath charged with 2 per cent of sodium nitrate and 7 per cent of spirits of salts. The silk is lightly rinsed and passed without delay into the cold developing bath, in which it is worked for twenty minutes. The hanks are then washed, soaped if desired, and then dried.

The following developers may be used in this process: Phenol, Resorcine, B. Naphtol, etc. These are stirred into a paste with their own weight of caustic soda, and are dissolved by pouring boiling water over them.

Neither the diazotizing or developing baths are exhausted, and, if dyeing several lots, these baths should be kept standing and replenished with about three-quarters of the original amount taken.

It is essential that no time should be lost in getting the silk into the developing bath after diazotizing, because the material is sensitive to light and heat, and, if left lying about, uneven results will ensue.

Shades which have been developed are fast to washing and cross dyeing, while the intensity of the shade in the majority of cases is greatly increased. However, the fastness to light is not similarly increased, but an after-treatment with bluestone may be given. The beauty of the shade may be considerably enhanced by topping with the basic colors.

A fine aniline black is obtained on artificial silk by working the hanks for some time in a cold and fresh mixture of the following solutions: A, B and C, equal parts of each. Then hydro-extract and steam in a suitable machine for a few minutes, and then finally pass the hanks into a bath of bichromate of potash at 140 degrees F. These operations should be followed by a thorough wash, hydro-extracting and drying on poles at a moderate temperature.

RECEIPTS FOR SOLUTIONS TO USE.

A—Chlorite of soda 2½ pounds and water 2½ gallons.

B—Yellow prussiate 5 pounds and water 2½ gallons.

C—Crystallized aniline salt 7½ pounds and water 2 gallons.

It is difficult to get uniform shades on artificial silks when the threads are not of uniform denier.

The following methods of distinguishing artificial silk from natural silk have been given:

(1) Boil with caustic soda. Natural silk is completely dissolved, while the artificial silk is not dissolved.

(2) When Chardonnet silk is dissolved in an alkaline solution, a yellow color is imparted to the solution. In the case of natural silk the solution remains colorless.

(3) Artificial silk is insoluble in an alkaline copper sulphate solution containing glycerine, in which natural silk dissolves at the ordinary temperature. To make the solution, dissolve 10 grammes of copper sulphite in 100 c.c of water, with 5 grammes of pure glycerine added, caustic soda being then added until the precipitate first formed is redissolved.

(4) Artificial silk burns quickly in a flame and very little ash remains. True silk combonizes when burned.

(5) Nitrocellulose or Chardonnet silk may be distinguished from other varieties by the following tests: Place in a, porcelain dish a few granules of Diphenylamine, over which pour a little strong, pure sulphuric acid, then gently warm. Nitrocellulose is colored a deep blue in this solution, while the other varieties of artificial silk, as well as natural silk, turns brown and gradually pass into solution.

(6) Artificial silk is reddened when treated first with sulphuric acid and then with brucine.

(7) If Chardonnet, Pauly and Viscose silks be treated in separate beakers with Fehling's solution, Chardonnet silk will, owing to its reducing action, impart a green color to the liquid. In the case of Pauly and Viscose silk, the liquid will remain blue. Now prepare a reagent consisting of 20 grammes of zinc chloride, 2 grammes of potassium iodide and 1/10 gramme of iodine, together with 15 c.c of water. If Pauly and Viscose silk be treated with this reagent and well washed, it will be observed that Viscose silk retains its blue-green color, while the Pauly silk quickly loses its color on washing.

(8) Analysis of imitation silk fabrics containing both genuine and artificial silk may be made by treatment with Lowe's reagent. Natural silk dissolves in this solution at ordinary temperatures in half an hour, while artificial silk is not affected. Lowe's reagent may be prepared by taking 10 grammes of copper sulphate crystals and dissolving them in 100 c.c. of water. To this add 5 c.c. of glycerine and a solution of sodium hydroxide until the precipitate first formed is just redissolved.

The ordinary strand of artificial silk, composed of a number of individual filaments, must be doubled and twisted together to give the hard surface required to pass through the eyes of the needle of an embroidery machine or similar machines. The doubling and twisting is done in a similar manner to cotton. When finished the thread is wound upon two-ounce reels upon a machine similar to that shown in Fig. 20, or into cross wound two-ounce cops or cheeses upon a machine similar to Fig. 21.

The cost of manufacturing artificial silk by the Chardonnet process has been given at about $1.26 per pound by the Viscose process, which is the cheapest of all at 54 cents per pound. The production of fine or low denier silk by the Theile process costs at least $1.92 per pound.

The costs of the necessary plant to carry on the Viscose process is about $50.00 per pound of silk produced per day.

Artificial silk is heavier than natural silk, its specific gravity being 1.5, as against 1.42 for Italian silk.

(*To Be Continued*)

Every man is the architect of his own fortune and it is his duty to see that the foundations are laid solidly.

An export business is strictly up to the manufacturer, not the Government.

BLEACHING TURKISH TOWELS AND KNIT GOODS.

BY WILLIAM B. NANSON, F. C. S.

Coming now to the second factor in bleaching, viz:—the removal of the matter added to the cotton fibre during its manipulation in the mill, such as dirt, oil, size, etc., we have a much easier problem to solve. The dirt may be loosened by steeping and the action of some detergent such as soap, soda and bleaching assistant. With regards to the oil, it has been found that if the goods are subjected to the action of water alone at 100 degrees F., or alkalis in the regular bleaching process, an indelible yellow stain is fixed upon the goods by the complete oxidation of its coloring principles and it is therefore indicated that the goods should first be carefully examined and any oil stains removed by the application of tetrachloride of carbon and washed out with olive or castor oil soap and run into the kier or steeping process before becoming dry again. It was discovered by a German chemist—and the *Societe Industrielle de Mulhouse* gave a medal to the inventor,—that the addition of aniline, toluidin, paraffin oil or phenol to the soap and soda in the first boil would entirely remove oil stains from cotton goods, and as his recipe might be useful to white bleachers handling towels, quilts, white ducks, etc., we will give it herewith:

Water	50 parts
Castor oil soap	3.6 "
Ammonia or ammonia soap	0.9 "
Soda ash	1.8 "
Paraffin oil, toluidin, anilin or phenol	0.5 "

We now come to the size contained in the warp amounting to about 10 per cent or more of the weight of the goods. This can be removed by steeping the goods in a weak solution of diastase.

Diastase is an enzyme found in many plants and which has the power of converting the insoluble starch into soluble sugar. Moistened starch, when subjected to the action of only a minute quantity of it (one part in 2,000) at 130 degress F., soon becomes disorganized and converted into soluble starch, dextrine and grape sugar.

It occurs in plants in two modifications, viz:—secretion diastase and translocation diastase. These differ in their distribution and their mode of action on starch grains and starch paste, and the temperature at which they are the most active. Translocation diastase is the more widely distributed of the two, being formed by fungi and bacteria, and in leaves and shoots, storage organs and pollen grains as well as in the seeds of plants. Its function seems to be to make possible the translocation of carbohydrate food temporarily or permanently stored as starch by digesting it into soluble sugar. Translocation diastase is therefore of the utmost importance in plant nutrition.

Secretion diastase is formed by special secretion cells in the embryo of seeds, especially in grasses, and plays its chief role in germination by making available the food stored as starch in the seed. Translocation diastase digests and liquifies starch slowly and erodes starch grains uniformly at the surface or in the center until they disappear. Secretion diastase liquifies starch paste rapidly and corrodes starch grains by forming irregular pits, which, penetrating the grain in various directions, deepen and widen until it falls to pieces.

Translocation diastase is most active at 113 degrees to 122 degrees F, and secretion diastase is most active at a temperature of from 122 degrees to 130 degrees F, and as diastase probably occurs in commercial diastase in both these modifications it is indicated that the temperature at which it should be used is between 113 and 130 degrees F.

I might also say here, while upon the subject of diastase temperatures, that like all enzymes, its action depends to a remarkable extent upon the temperature at which it is used, the presence of free acids or alkalis, and various salts. It is inactive below 50 degrees F and above 141 degrees F, and it is destroyed at 160 degrees F.

It has also been found that diastase is destroyed by light, particularly by blue or violet rays and it may be further said that diastase in solution changes so rapidly that it soon becomes acid and loses its power of transforming starch, so that it must be used promptly upon forming its solution. It also is destroyed by boiling in solution, an important fact which may be taken advantage of in bleaching processes as it is in the brewing industry.

The action of diastase on starch is one of hydrolysis, i. e., it causes the starch to combine with water and break up into simple compounds. The intermediate steps in the process are not known, but the ultimate products of hydrolysis are, a variety of sugar called maltose 80 per cent, and dextrine 20 per cent. Diastase acts most effectively in a weak solution of common salt and carbonic acid, both of which are ordinarily present in plant cells, but this combination is hardly practical in bleaching.

I have now shown to the reader the foreign and native bodies inherent to the fibres and the extraneous matters added to them during the process of manufacture as well as the characteristic changes which take place during the processes of steeping and boiling induced by the action of various chemicals used and we may therefore form the following conclusions so far as Turkish towels or knit goods are concerned:

First. That liming and caustic alkalis are positively injurious because they largely remove the waxy matters and the binder from the fibre and deprive the goods of the elasticity of their strengthening support; neither do they assist in making the goods white, and further the removal of the cutine or wax by the agency of lime or soda superinduces a subsequent yellowing of the bleached goods.

Second. That to boil the goods before steeping or softening up the starch and before soaping the oily spots and adding some capillarist such as anilin oil or phenol to the first boil, causes the complete oxidization of the coloring principles of the oil and fixes it indelibly on the goods as a bright yellow stain.

Third. That diastase at a temperature of 113 to 130 degrees F will remove all the starch and most of the pectin matters without boiling at all.

Fourth. That the careful examination and washing in castor oil soap of all oil stains and the addition of some capillarist, such as anilin oil, petroleum or phenol to the liquor in the first boil in soda ash soap, etc., will effectively remove all oil stains.

We have now to consider the mechanical or physical structure of a Turkish towel and the best method of handling them mechanically so as to meet all the requirements of their particular case.

These towels are woven in the loom from two separate

warps,—a ground warp, and another which forms the pile. The ground warp is held under a heavy tension, while the beam which holds the pile warp is held lightly, only enough tension being applied to prevent the beam from getting too slack or overrunning; this tension is regulated by a pattern chain. While two picks are being put in, the pile warp is held tight; but on the third pick the tension is released. By means of a peculiar arrangement the reed does not force the first two picks up to the fell of the cloth but leaves them a short distance from it; this distance is regulated by the length of the pile required. With the third pick however, all three picks are forced home to the body of the cloth, and the tension on the pile warp being suddenly released on this pick, it will be pushed out in loops on both sides of the towel. The ground warp being heavily weighted does not come forward with the pile warp, but the three picks slip up together on it and are beaten up to the fell of the cloth.

FIG 1.

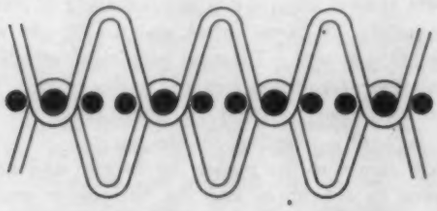


FIG. 2

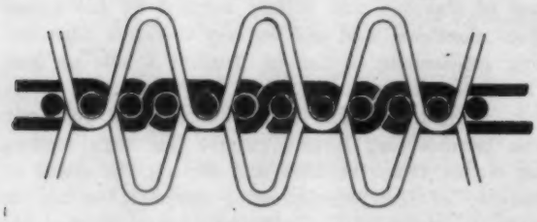


FIG. 3.

Fig. 1 illustrates the pile warp only, interlaced with three picks of filling,—the black dots show the filling and the white cord the pile warp. This is shown just as it would look if the filling were not beaten up together on the ground warp.

Fig. 2 shows a section where the picks have been forced home and the loops of the pile warp formed on each side of the towel.

Fig. 3 illustrates the relative positions of the ground warp (which is shown by the black lines or cord) and the pile warp; the black dots representing the filling and the white cord the pile warp. The reader will notice that the ground ends are interlaced with the picks placed between the upper and lower pile loops. This is necessary to prevent the filling from being forced up with the loops of the pile warp.

From the above description of the physical construction of the Turkish towel, it will be quite potent to the mind of the observer that careful and intelligent handling is required in the bleachhouse to produce good work, especially in two very important and essential particulars. First, the towels must not be squeezed heavily or the pile will be flattened and depressed, neither must they be brought into close pressure contact with any hot surface, such as drying cylinders or heated metallic mangle rolls, as such contact will also flatten out the loops and spoil both the feel and appearance of the towels. Second, the towels must not be pulled or stretched in the direction of their length. A glance at the figures 2 or 3 will make it plain to the reader that any undue tension on the ground warp, i. e., in the direction of the goods longitudinally, will have a tendency to pull down and straighten out the pile and make it shorter and these sketches (Figs. 2 and 3) ought to fully convince the average bleacher that the undue pulling or stretching of Turkish towels is one of the things to be avoided in a bleachhouse.

In consequence therefore of the very obvious damage to the physical condition of the goods by stretching and squeezing them and the consequent impairment of their merchantable value, I would advise a cotton mill which is making, bleaching and finishing its own Turkish towels (if its product is not over 4,000 pounds daily) to wash and bleach everything by means of centrifugal circulating pumps or dashwheels, and extract the superfluous water or liquor by means of the hydro-extractor instead of the usual squeezing rolls.

(To Be Continued.)

The Textile Fiber Industry of Brazil.

With the world's source of cotton supply in the main limited to the United States, and in view of the repeated failures to develop the cotton growing industry in India and Africa on a very large scale, it would seem that Brazil will, within generations, witness an extension of its cotton industry, and when such a time comes, its cotton-bearing trees will have their share of attention in this respect. There are, indigenous to Brazil and growing wild in certain regions, two species of trees of interest to the commercial world, because of their possibility as producers of cotton fibers. The first tree, Barragunda, from having a barrel shape trunk, grows to from 25 to 35 feet in height, tapering from the great bulk in the trunk to a very slender one, from which branches form about 12 feet above the ground. Parts in which the cotton grows are from 5 to 8 inches long and 2 to 4 inches in diameter. The fiber is coarse and white, long and strong, and while too coarse for use in textiles of any degree of finishes, it would, it is said, lend to the fabrication of blankets, cotton twine and a variety of other materials. The second tree, Imbirussa, produces a much finer cotton, and of a brownish color, which is exceedingly light but not long enough to spin well, and resembles eiderdown. It is so light and fluffy that the entire contents of a box can be blown free from the outer enclosure or hull. It is a remarkably strong fiber, and a strip half an inch in width will, without any preparation, sustain a weight of 50 to 100 pounds. The tree, which has a peculiar and characteristic bark, has a habitat in Bahia and Northern Minas, being most abundant in the latter state, and is called Imbirussa.

Many fellows who kick because they're not leaders of the orchestra are lucky to have a job at second fiddle.

Inquiries about anything pertaining to the textile industries will be cheerfully answered by COTTON.

Practical Problems Discussed by Cotton's Readers

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all. Suitable letters are paid for in cash.

SIZING AND TWIST IN THE CARD ROOM.

EDITOR COTTON:

The subject is one which, although it is the essence of carding and spinning, has been abused the most in relation to cotton spinning, and as there are so many ways to evade the results of sizing and putting in or taking out twist, it is one which should be thoroughly understood.

Because cotton has variations in the length of staple in the same bale, and because of the difference in climatic conditions caused by the mill location, it would be impossible, even with perfect carding and spinning, to produce an even yarn.

Sea Island cotton, combed and double combed, a process which takes about 25 per cent of short fibers out of it, is found to vary yard per yard. A perfect thread or yarn is what we should try to get notwithstanding that it cannot be accomplished. It is much better, if an even thread is desired, to have three systems of draw-frames, as when only two are used, only 36 doublings are achieved, while three frames give 216 doublings, which greatly reduce unevenness.

Besides keeping track of the weight of laps in the picker-room, and the sliver from the drawings, the roving for sizing should be taken from new slubbing and intermediate so that it will show whether *the stock coming* is lighter or heavier; otherwise a size taken at random might be from bobbins which have been on the creels for a week or so, and there would be no danger from piecings when changing bobbins, which causes short lengths of roving one-third heavier than it should be.

A good place to change when the work is a little heavy or light is the roving-frames, as then the roving going to the spinner is changed at once; whereas, if you change elsewhere, there is a lot of work to go through before the change would reach the spinning-room. One tooth on the roving frame draft-gear, if the gear used is 33 teeth, say, making a 4.75 hank roving, should only make a difference of 14 decimal points, which would equal about five times as much on a 25.25 yarn using 11.13 draft. For example: A 33 tooth draft gear making a 4.75 hank roving with 11.13 draft, and 3 per cent allowed for contraction, should give 25.62's yarn. If the size report, when returned to the carder (which is the only means for him to know how the numbers are running), instead of being 25.62's, should be 26's, the proper thing to do would be to put on a 34 tooth draft gear, which should bring it down to 25.25's again. If the size should read 24.50's, then a 32 tooth draft gear will be the right one, and this will keep the yarn where it belongs as near as it can be done.

The changing at all times is done in the card-room; only in exceptional cases, where the yarn is extremely light or heavy, would it be remedied by the spinner changing in order to make the roving right which is already on his creels and out of reach of the carder.

In sizing yarn the method generally adopted is to weigh the yarn produced from, say, eight rovings, separately, in order to note the variation, as experience shows that sometimes a single or a double may creep in, which, were the yarn weighed together, would give a wrong resultant yarn. The one objection to this method of weighing lies in the fact that the size so weighed will not show the true counts, as, in being weighed four times, the four draws of the scales would give in figures a lighter yarn. The best way is to weigh both ways; then you get by weighing separately the variations, and by weighing together the true counts of the yarn. I have worked in well-regulated mills, where the sizing was done in the office, and when it was noticed that a change was necessary the order was so given.

As to the effect of twist in roving in regard to production especially, it should be remembered that production can be obtained either by making a heavier hank or by putting in less twist. By making a coarser hank, it enables us to put in less twist, which speeds up the front roller. If you are making a 5-hank roving, and in order to keep up with the spinning-room you reduce it to 4.75, it is not advisable to alter the twist or so small a change if the roving frames were running none too good before, as the increased draft in the spinning-room will easily allow the card-room to keep up, and also make better roving owing to less ends breaking down. Never take undue advantage of a coarser roving by taking out all the twist which might be possible during good weather, because sooner or later you would be held up to a production you could not make, on account of atmospheric conditions or a difference in the cotton, etc.

The proper way to do is to have on a twist-gear which will not have to be changed every time the weather changes, though in some places you have to put on a smaller twist-gear to keep the work running good. Some people swear by the twist constant, which for American cotton is the square-root of the hank roving, multiplied by 12. The square root of 4.75 hank roving is $\sqrt{4.75} = 2.17 \times 1.2 = 2.60$ per inch, which is supposed to be the standard turns per inch to put in for 4.75 hank roving. But what about the staple and the strength of the cotton? The perfect constant is the one which will make the work run good, without many ends breaking, whether it is 2.60, 2.20 or over 3 turns per inch.

In some cases, if you put in the standard turns per inch, you could not run the machines. It is detrimental to speed machines up if the speed is already high, and that is exactly what it does when you take twist out of the roving, as the gearing, with the single exception of the spindles, goes faster.

Now, one more fallacy which comes to mind as to the increase of production you can get with less twist per inch. Suppose you are getting 24,656 pounds per week of 54 hours with a 35 tooth twist-gear giving 130 r.p.m. of front

roller. It does not follow that you could get 29,204 pounds in proportion (as it figures out with a 41 tooth twist-gear, the one which would put in the standard turns per inch), because the machines would be stopped half the time on account of ends breaking, and the chances are that the roving would stretch and break in the spinning-room creels.

Another point is that it is policy to have a shade too much twist rather than not enough, as it is well known that twist always runs to the thin places, thus helping it to make a stronger and evener yarn.

I would like to hear from others on this subject, as there is lots more to be written on it. One thing in particular—never let the numbers get away from you. If you are making 25's yarn and you let it run in the 26's or 24's very long, the weekly or monthly average might be 25's, but that does not remedy the light or heavy work that has gone through the mill. Lance (Michigan).

SETTING THE SPOOLER.

EDITOR COTTON:

There are a few things worth remembering about spooling. Some think it is only taking away the full spools and having pieces ready for the spooler-tenders, but those who think so are very much mistaken. There are a number of things to be done in order to get a perfect spool—that is, a spool which will run on the proceeding machines without having the end caught near the flange of the spool every time it runs from one flange to another. Some men who have spoolers in their charge will sometimes have a machine changed over from small to large spools, giving the fixer or section hand the order, who, in turn, goes right to work on changing the spooler.

For instances, suppose he is running small spools and wants to change over on big ones; he may have the rails regulated right, but, on the other hand, the point that I am trying to convey is the distance from the yarn on the spool to the flange, for there should be a clearance space, because if the rail goes up to the flange of the spool there is sure to be a bad set of spools as the result; whereas if say one-eighth inch of space is allowed, by the time that the spool is full the yarn is up to the flange intsead of being jammed up, which means that just as soon as it reaches the next machine, which may be a twister or warper, it will be bad running for this particular set of spools, because every time the end gets near the flange of the spool it snaps. This means a great deal of trouble both for the tender and overseer, for the yarn goes full of knots on account of the constant piecings.

In order to make this point clear, I have made three sketches which may prove of assistance to the reader in understanding the text. Fig. 1 is the bare spool, of which (a) is the flange that I wish to make clear, and (b) is the barrel of the spool in which the yarn is wound. In this figure the spool is shown cut in half so as to show the inside of the spool. Fig. 2 represents the spool with some yarn on it, and also shows the distance of the yarn from the flange, which is necessary in order to have a perfect spool and one which will run good. In this figure (a) is the flange of the spool, while (b) is the barrel shown in dotted lines; (c) is the end of the thread or yarn that is drawn from the bobbin onto the spool, while (d) is the yarn which is on the spool. Notice the distance from the

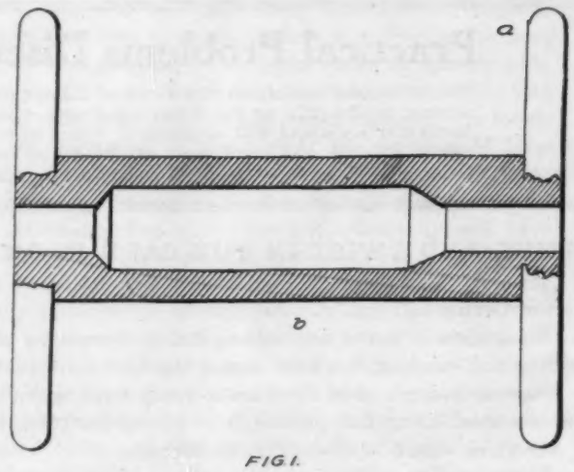


FIG. 1.

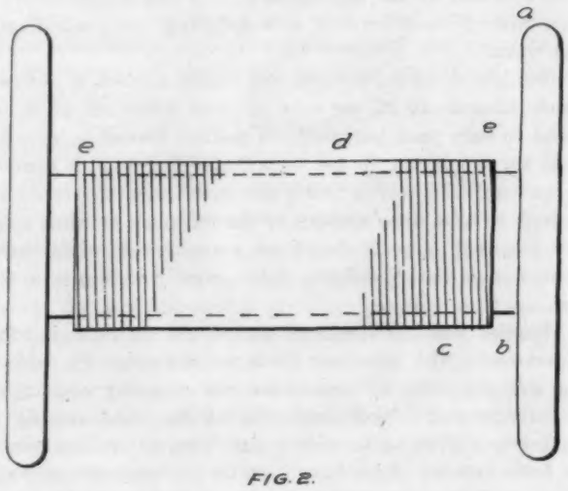


FIG. 2.

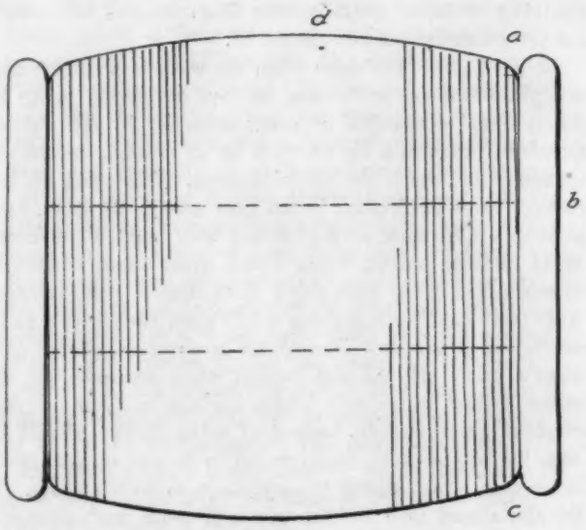


FIG. 3.

flange as indicated at (e). Of course, on a real spool the yarn would be nearer the flange in proportion, but this is merely an illustration to call attention to the point. I said nearer the flange, which means a little closer than the illustration shows, and still not jammed against the flange

as I have seen it in some mills. In Fig. 3 the spool is shown as it looks when it is ready for the next process—that is, full of yarn and of the right shape and size. (a) represents the flanges of the spool; (b) indicates the barrel of the spool in dotted lines; (c) illustrates the end of yarn which has been broken off from the bobbin, while (d) is the surface of the yarn on the spool. Note the way the yarn slopes down to the flange instead of being even, which is a bad practice. If it were even it could not have such a barrel-shaped appearance, which is the correct shape for a spool that is ready for the next process.

These things occur in a great many mills because there are careless section hands who do not know how to set a spooler—that is, to allow space both at bottom and top of the spool. When the space is not allowed, nine times out of ten the spools are useless on account of the breaking of the ends at the flange. With the spooler set with no allowance for clearance, the amount of waste is increased, because when the spools are in bad shape or in poor condition, owing to the yarn being jammed up close to the flanges, or over-running the surfaces of the flanges, the spools are cut, which is a loss in production. The best shape for a full spool is barrel shape, because it is easily unwound at the next process, and the yarn on it will not run off the ends or flanges of the spool, which is a great help.

Lewis (Mass.).

PRODUCTION AND HOW TO GET IT.

EDITOR COTTON:

In a recent article I tried to point out a few things that cause weak yarn in the ring spinning room. In the present one I will dwell on the subject of production and how to get it. It is one thing to figure your production. It is an easy matter to get it on paper. But it is altogether another thing to get it in actual pounds, and as the actual pounds is what sells or brings in revenue, so it is the actual pounds that we want to know how to produce, quite as much as how to figure such production.

The production of a ring frame is regulated to a great extent by the r.p.m. of the front or delivery roll. Hence by speeding up or slowing down this roll, the production is either increased or decreased. However, there are two things to be considered in the change of speeds for this roll: first, the turns per inch, or the number of times the yarn must be twisted to the inch in order to give it the required strength; second, if the speed is too great or excessive, the work will run badly, causing the ends to break repeatedly, this in turn causing the help to either be overworked, or cutting their pay by having to put them on less work. Excessive speed also produces more waste material that otherwise would have gone into good thread.

The catalogs that are sent out by the machine builders have their respective speed and production tables. But there are very few mills coming up to these tables, as they are on too high an average. For instance, the Fales & Jenks catalog calls for 116 r.p.m. of the front roll. Draper calls for 120 r.p.m. on No. 30's yarn warp twist. With good cotton these speeds can be maintained, but on ordinary 1 inch staple the former speed is too high, as 110 or 112 is all that can be done, and get good results. I have run 30's yarn with a front roll speed of 125 and had good running work, but my yarn was breaking above 75 pounds, and I used nothing under 1 3/16 inch cotton.

My experience has taught me that a medium speed and good running work is the better way. There are many ways to increase the production besides high speed. Mr. Overseer, did you ever stop and study a while and look for the leaks in your room? There are many of these leaks, yet we go on, week in and week out and fail to get the pounds we should and never know why we do not. What about the ends broken back that are out of fix? A band off here and there. A spindle out in first one alley and then another. They don't look like they amount to much. Yet they are leaks and should be stopped.

Suppose we have 120 frames or 240 sides in a room and average one end broken back on each side. Suppose we get 1.20 pounds per spindle per week $240 \times 1.20 = 288$ pounds per week. Why not make a special effort to reduce the average "broke backs" by having the ends fixed, keeping the bands on and seeing that the spinner keeps all ends running. A good way is to have the broke back ends counted once or twice each day and a report made. Sometimes a belt gets slack and slips on the face of the pulley causing the frame to lose some of its speed or have an irregular speed. Perhaps cotton has accumulated on the face of the belt to such an extent that it prevents the surface of the belt from coming into direct contact with the face of the pulley, hence a continuous slipping, and when the other frames are full and ready to doff, this one will run on for thirty minutes or more. Sometimes both counter and frame belts get hard and brittle for lack of being properly dressed. All belts should be carded and dressed at least once a week, in some cases, twice a week is not too much.

Another evil is the continuous stopping of frames by the spinner to unchoke a roller or clean off something, or probably a stand of ends is down and she wishes to twist them up. Of course the spinner thinks it doesn't amount to much and it does not, just for one spinner, but if one does it, they will soon all be at it and then it will amount to a whole lot. Spinners should be taught to get steel roll laps off while the frame is going, and all cleaning which cannot be done while the frame is running should be done after the room is shut off on Saturdays especially for that purpose.

Another thing of much importance is the starting up each morning and at noon. The section men should begin starting the frames at least three minutes before the whistle blows in order to have the room all running at the regular time.

All of these are small leaks and some which are often neglected by overseers. These small things are what count, and should have the attention of the overseer in person if they are looked after at all. We all see the big things but are prone to overlook the small ones.

Another thing worthy of our consideration is doffing. In most of our Southern mills the doffing is done by boys from 12 to 16 years of age, and owing to their age and inclination to slight their work, I feel it necessary to put a man over them to furnish a head for them. I require this man to stay with them from start to finish and see that they do their work well. First, he must see that each one of the sets is ready to and does start at the same time. This man pulls down the first traverse, and when the frame is doffed he lets the traverse up and winds same. He sees that the boys piece up the ends that were broken while doffing and then pulls down the next traverse and the

work is a continuation of this throughout the entire doff, or until all of the frames are doffed.

Once upon a time, just after taking charge of a large spinning room where the doffers were allowed to stop as many frames as they pleased, and the best doffer tried to see how far behind he could leave the other doffers, I inaugurated this rule of one frame at a time, I called all of the men to the desk and asked their cooperation in carrying out this rule. And all of them but one got right behind it from the start. I kept having trouble with this one and I knew it was his fault. I came along and saw four frames stopped, and he was away to the other end of his job, so I called him and asked him if he couldn't stay with those boys and make them keep those frames running. His answer was, "I told them not to stop but one frame at a time." I just took hold of his arm and walked with him to the end of the room where a little red-headed boy was making bands. I pointed and said, "Do you see that boy?" He answered, "Yes, of course." "I am paying that boy 40 cents a day," I continued, "and he could have done as well as you have done what I am paying you a good salary to do. You go back and from now on when you tell people to do anything, don't stop at that, but see that they do as you tell them." That settled my trouble and helped to get production.

Many other things could be mentioned, and I do not mention these because I think others do not know them, but purely as a matter of refreshing our memory and to urge us to action.

Student (Alabama).

A PECULIAR PROBLEM.

EDITOR COTTON:

When I first began work at a mill in a thriving mill district of a Southern state, they were making a mock twist yarn, spinning 13's for warp and 14's for filling. That is, they were running a strand of colored roving, say black, and a strand of white roving, through the trumpet of the spinning frame and twisting them together. The colored roving was put in the top creel and the white roving in the bottom creel. The color effect gained was practically the same as it would have been if two strands of yarn had been twisted together on a twister. This mill did not have twisters, so the spinning process was resorted to in order to gain practically the same color effect, and yet eliminate the process of twisting. The yarn made was used in making a line of crash goods.

Everything worked smoothly enough until the yarn was woven and carried to the cloth inspectors, where cut after cut was turned down and thrown into the pile of seconds on account of different shades of filling. The trouble was all with the filling, for it can readily be seen that if a light shade of gray is run and followed by a quill of a darker shade, that the cloth will vary in shade every few inches or every time a new quill is put into the shuttle.

The warp was of little consequence, as the darker ends were scattered across the cloth from selvage to selvage at irregular intervals and went practically unnoticed. Cuts going into seconds meant a pecuniary loss to the mill, and a searching investigation was instituted in order to ascertain the cause of the trouble and a remedy therefor. While this investigation was taking place it was the duty of the writer to inspect each doff of filling and separate the two shades so that they would go into different cuts of cloth.

On noticing the spinning frames, we saw that the black passed through the trumpet and lay on the right-hand side of the white, between the rollers in some cases and *vice versa* in other cases. As the two strands passed from the rollers, the white was twisted around the black in some cases, while in other cases the black was twisted around the white, the background in one case being black and in the other case white. This was the cause of the two different shades.

Having found the cause, we next looked for a remedy for the trouble. The problem was to make the black stay on the same side of the white in all cases. A double trumpet

would have done this, but the mill did not have double trumpets. The yarn was being spun on Howard & Bullough and Lowell frames. On the Lowell frame the rod in which the trumpets are placed is made of wood. For these frames we secured a flat wire and cut off pieces about two inches long. These pieces were then bent into the shape of a capital F, as shown in the sketch at D. The short end of the wire was driven into the wooden slot so that the longer end would be at the back of the trumpet, and the black strand was put in on the right-hand side as we faced the frame, and the white on the left-hand side. The illustration will show very clearly what we did to the Lowell frame to prevent this trouble, as it gives a view of the back side of the trumpet.

Suppose A to be the trumpet rod and B the trumpet itself. Then C is the wire which, driven in at the top of A, divides the rovings as they pass into B.

On the Howard & Bullough frame the trumpets are secured to a metal trumpet rod by means of screws, so we resorted to another method on these. We secured some thin bars of flat steel, about three-eighths of an inch wide, and cut strips about two inches long and placed one end in a vise and twisted the other end half way around. Then we made holes in them for the screws to pass through. We took off the trumpets and placed the pieces next the trumpet rod, and then put the trumpets back on. When we had made these changes the trouble disappeared and everything began to go smoothly so far as this class of work was concerned.

This is the kind of problem that I like to read about, and so I am submitting this one in the hope of interesting some other readers who keep a scrap book as well as a note book. I will appreciate reading the experiences of others in describing the peculiar problems they may have run up against in the course of their mill work.

"Windy" (North Carolina).

An official return shows 89 power cotton factories at Bombay, of which twelve are cotton ginning, cleaning and pressing factories, and seventy-seven spinning and weaving mills.

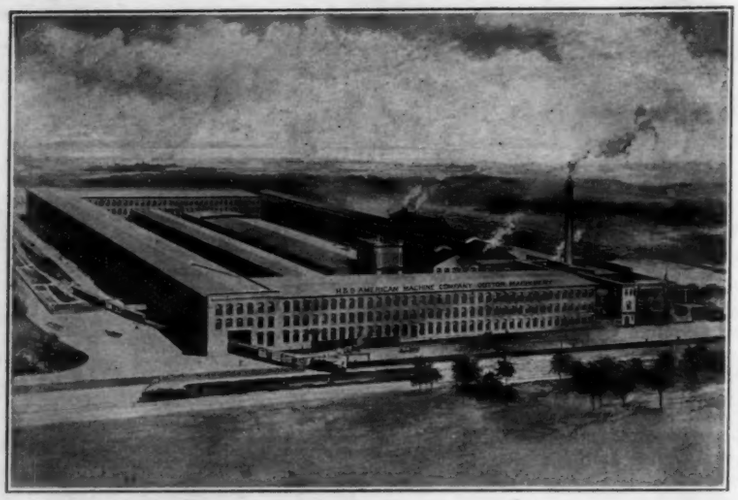
C. E. RILEY, Pres.
Boston Office
65 Franklin Street

Southern Offices
814-815 Empire Bldg.,
Atlanta, Ga.

COTTON MACHINERY

Opening and Picking Machinery

Card Room Machinery



Spinning Room Machinery

Twisters for Wet or Dry Work

With Band or Tape Drive

H. & B. AMERICAN MACHINE COMPANY

PAWTUCKET, R. I.

New Machinery and Trade Notes.

A RETROSPECT.

"About twenty years ago," says the DRAPER COMPANY, in *Cotton Chats*, "in the fall of 1894, we shipped the first Northrop Looms on a commercial order. We accepted our first order after long experiments involving an expenditure of a large amount of time and money. While we had reason to believe that our filling battery and warp stop-motion were sufficiently developed to be operative under mill conditions, it was with some anxiety that we followed the operation of these looms after placed in charge of the regular help.

"Much to our surprise, we found as time ran on that our special features of filling battery and warp stop-motion were better adapted to the problem of automatic weaving than were the other parts of the loom, including practically all of the moving parts and even the general design of the loom frame.

"In the method followed by weavers on common looms, weaving was largely a question of skill of the individual, and not one of mechanical certainty of operation in the machine. When a bobbin ran out, the shuttle was changed by the weaver. He perhaps ran his hand along the cloth at the point where the filling was introduced by the new shuttle; or he made some change in the let-back on the take-up; or another time did something in handling the lay, so that perfect goods might be produced and no blemish caused at the point where the filling was changed by introduction of a new shuttle. All this required education and long experience on the part of the weaver before he became an expert—if he ever did.

"The automatic loom, on the other hand, had to change the filling and take care of these possible blemishes at the time of the change without the aid of any intelligence of the weaver. The advantage of the Northrop automatic loom in enabling the weaver to operate many more looms carried with it the necessity of doing away with skill and judgment of the weaver at the critical point when the bobbin was changed.

"As this fact became more and more in evidence, our inventors and designers were given the problem of improving the loom itself as a weaving mechanism so that the character of the goods woven would be satisfactory, and that there would be no danger of thick and thin places or other imperfections at the time of transfer of the filling bobbin.

"Following this line, our early models of looms were gradually abandoned; the let-off was improved with the invention of the Roper let-off, a modification of the old Bartlett let-off, but arranged to automatically take care of the difference between the full and empty beam.

"Improvements were made in the thin place preventer and in the vibrating whip-roll to meet the requirements of various weights of goods. The take-up was replaced by

the Northrop high roll take-up, which gives cloth with much more uniform width and assists the loom temple in properly holding the goods during the cloth-making period. Modifications to admit of either gear or worm drive were developed; also the Nutting improvement to admit of increased length of cloth between the cloth-making point and the take-up roll. The "feeler" was invented to match the pick when the bobbin was changed. New pick-motions, harness cam-motions and overhead harness-motions were brought out from time to time, so that finally there had been more development in the older part of the loom construction than all of the combined changes on looms for plain weaving during the previous thirty years.

"Also the loom frames were strengthened and the weight of the looms materially increased. Expensive machines were introduced in our works, by the use of which all the joints of the loom frames were machined together, giving uniformity of construction and a degree of stability under weaving conditions never before found in looms made in this country.

"Our latest development is the adoption of cut gears. while this called for a very large plant of gear-cutting machinery, it meant better running gears in the loom, and ultimately more uniform and better cloth in the product of the mill."

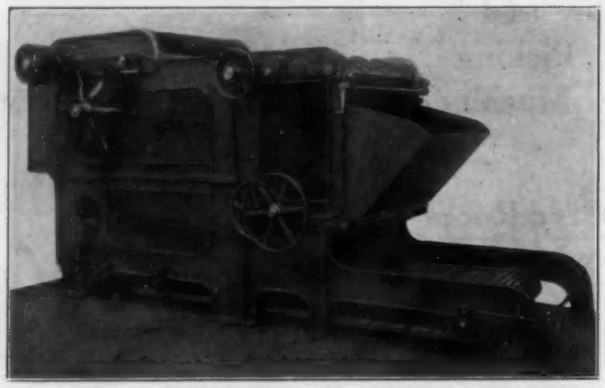
With the above experience they are in a position to furnish an automatic loom for weaving goods made with one shuttle with thoroughly modernized design and arranged to properly cooperate with the filling battery and warp stop-motion.

Turner, Tucker & Co., Inc., 24 Milk street, Boston, Mass., have recently issued the quarterly circular for April, in which they submit descriptions of selected securities which they believe to be attractive investments. The securities described, besides being exempt from taxation in a number of states, are also free from the Federal income tax. A copy of this circular may be secured on application.

A NEW WASTE WORKING MACHINE.

Among the machines shown by the POTTER & JOHNSON MACHINE COMPANY, of Pawtucket, R. I., at the Fourth National Textile Exhibition at Boston, was the new machine illustrated herewith.

The purpose of this machine is to open the raw cotton and mix with it the card sliver, drawing sliver, etc., which has to be re-run by all mills, and is nominally termed "waste." Card and drawing sliver and comber lap waste can be put directly into the waste hopper and will be thoroughly tron up by the action of the spiked apron and comb. Spinners' "stick waste" should be run through a thread extractor first, and roving "waste" should be run through a roving waste machine before putting into the hopper.



THE NEW POTTER & JOHNSON WASTE MACHINE.

This "waste" hopper can also be used to mix in a lower grade or shorter staple bale of cotton, which, from choice or necessity, it may be desirable to distribute amongst a number of bales. It may also be arranged in connection with their Double Hopper Feeder so that colored cottons could be mixed with raw stock more evenly than by weighing separately and mixing on the floor.

What kind of articles would you like to see in COTTON?

Which departments interest you most?

.....

.....

.....

Name.....

Address.....

Position .....

CUT OUT, FILL IN AND RETURN THIS BLANK.

Notice. Because of the time necessary to collect data, or locate some person peculiarly fitted to write on a subject, applicants must not expect to see subjects suggested appear in the next issue. They will, however, appear in due time.

Barrett Specification Roofs

A $10. repair bill on 70 acres of roof—over a 16-year period

THE Bush Terminal Buildings in Brooklyn, N. Y., extend a mile along the shore.

The net roof area of these buildings is 3,100,000 square feet—or more than 70 acres. Every inch of this is roofed with Barrett materials—and, since 1897, when the first roof was covered, the cost of maintenance has been *less than $10.00.* The Bush Terminal people write us:

"We use this kind of roofing because our experience has shown it to be the best and cheapest. Our analysis of first cost of application and cost of maintenance entitles us to speak with some measure of authority."

The idea behind The Barrett Specification is an old one, established by years of experience—namely, that coal tar pitch, tarred felt and gravel or slag, when properly laid, make the best and most economical roof.

Architects, engineers and contractors know that if The Barrett Specification is followed absolutely, the resulting roof will last longer and cost less than any other kind.

Hydronon

The Damp-proofing Paint

Especially recommended for use above the ground level on the interior of stone, brick or concrete walls to exclude dampness.

Has superior covering capacity and is vastly superior to other paints in its permanence and resistance to dampness. It penetrates into the pores of the brick so that an accidental abrasion does not break the waterproof seal. Furnishes satisfactory base for plaster and keeps the plaster from injury by dampness in the wall.

Special Note We advise incorporating in plans the full wording of the Barrett Specification in order to avoid any misunderstanding. If any abbreviated form is desired, however, the following is suggested:

ROOFING—Shall be a Barrett Specification Roof, laid as directed in printed Specification, revised August 15, 1911, using the materials specified and subject to the inspection requirement.

Booklets on request, including a copy of The Barrett Specification.

BARRETT MANUFACTURING COMPANY

New York Chicago Philadelphia Boston St. Louis Cleveland Pittsburgh
Cincinnati Kansas City Minneapolis Seattle Birmingham

THE PATERSON MFG. CO., Ltd.: Montreal. Toronto, Winnipeg, Vancouver, St. John, N. B.; Halifax. N. S.; Sydney, N. S.

DIVIDENDS INCREASED BY AIR CONDITIONING.

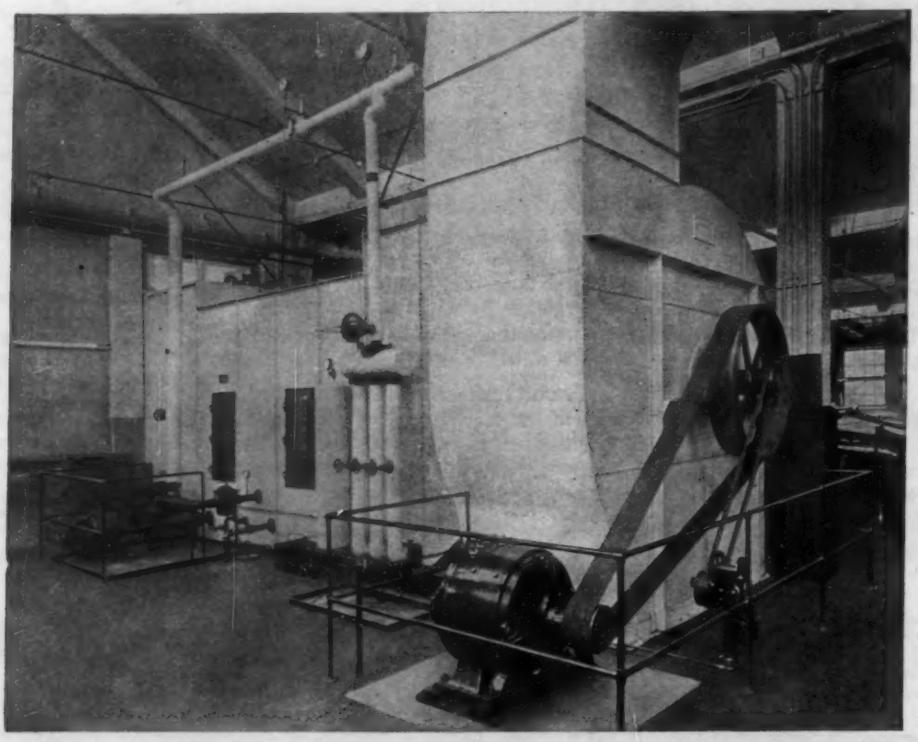
The necessity of humidifying textile mills has become so universally recognized that we have progressed beyond the question of whether or not any artificial humidification should be adopted, and it is now a question of the method to be employed and the advisability of maintaining regular and uniform humidification at all seasons of the year.

Formerly it was considered sufficient if humidifiers were installed to a sufficient extent to prevent the very dry conditions which occur during the colder months, when the most trouble was obtained from static electricity. However, those mill men who have made the greatest study of the question are, without exception, of the opinion that while a plant may be operated more successfully in summer than in winter without artificial humidification, still the production can be increased in summer as materially as in winter by cooling the mill and maintaining the proper humidity continuously.

In any mill where the conditions are allowed to vary from hour to hour, as is the case with every system which does not employ automatic humidity control, the production is not as great, due to the fact that it is very seldom in such mills that the humidity best suited for the work is maintained.

It has only been in recent years that mill managers have come to realize that it was possible to cool textile mills to temperatures very much below those of the outside, during hot weather, with apparatus entailing a reasonable first cost and a reasonable cost of operation. It is said that the first successful plants for maintaining low temperatures in the mill in summer which were installed in this country were manufactured by the CARRIER AIR CONDITIONING COMPANY, of No. 39 Cortlandt street, New York, N. Y., their first installations in cotton mills having been made at the Peerless Manufacturing Company, Lowell, N. C., and the American Thread Company, Kerr Mill No. 3, Fall River, Mass., which have been followed by many other installations in the cotton industry, among which may be mentioned the Farr Alpaca Company, main mill and weave sheds, Holyoke, Mass.; Ashland Cotton Company, Jewett City, Conn.; Sharp Mfg. Company, New Bedford, Mass.; Hamilton Mfg. Company, Lowell, Mass.; Ludlow Mfg. Associates, Ludlow, Mass.; Passaic Worsted Spinning Company, Passaic, N. J.; Indiana Cotton Mills, Cannelton, Ind.; St. Maurice Valley Cotton Mills, Three Rivers, Quebec; and Riverside & Dan River Cotton Mills, Danville, Va.

The apparatus employed in these mills is comparatively simple. The entire apparatus for heating, humidifying and cooling of the mill is placed at one point, so that it is accessible, and the attendance required is small, and the apparatus, being consolidated, allows of easy and quick attendance and inspection.



AIR CONDITIONING MACHINERY AT THE PLANT OF THE JOHN B. STETSON CO.

The apparatus as usually installed consists of a large steel plate fan with the humidifier through which the air is drawn, and where it is sprayed, washed, cooled and humidified to the amount required, and in winter is then passed through heating coils before entering the fan, so as to heat it up to the required temperature. The air is blown from the fan usually through ducts or flues and distributed throughout the mill in the quantity required to maintain the proper air conditions.

Where the mill has more than one floor, the heating coils, instead of being placed between the fan and humidifier, are usually located at the flue outlets on the different floors, thus enabling each floor to be heated and humidified independent of the others.

The cooling of the mill by this apparatus in summer is

THERE IS NO RUBBER IN THE COMPOSITION OR PRONUNCIATION OF RU-BER-OID

RU-BER-OID
PRONOUNCED "RU" AS IN RUBY
ALWAYS SPELLED WITH ONE B.

Critical Facts For the Buyer of Roofing

TRADE MARK REG. U.S. PAT. OFFICE.

RU-BER-OID is the original flexible, smooth surfaced, prepared roofing. Its introduction, in 1892, followed some five years of experimentation, in which The Standard Paint Company employed the services of skilled chemists in America and abroad. This opened a new era, and for the first time a ready-to-lay roofing was offered, which was free from the disadvantages of tar roofings, and which would not run under the most severe heat or crack with extreme cold. Its serviceability is vouched for by the fact that the first RU-BER-OID roofs applied in 1892 are still in good condition, still serviceable and weather-proof.

KA-LOR-OID (Colored Ruberoid) came later, and possesses all the enduring characteristics of RU-BER-OID with the added feature of having attractive and permanent colors worked into it in the course of manufacture.

Both RU-BER-OID and KA-LOR-OID consist of a felted fabric which is saturated and coated with flexible RU-BER-OID Gum.

There is no secret about the foundation of this fabric. It is the best roofing felt procurable. The only secret lies in the process of making RU-BER-OID Gum. This Gum is water-proof and as flexible as new rubber. Yet, unlike rubber, it retains these qualities when exposed to the elements. Rubber rots after slight exposure. RU-BER-OID and KA-LOR-OID retain their life and flexibility under the severest weather conditions.

We Originated and have kept on improving

RU-BER-OID and KA-LOR-OID (Colored Ruberoid) contain no rubber or tar. They are not "asphalt" roofings. They may be used on roofs from which drinking water is gathered without effecting the water in any way.

They are effective insulators, for they exclude both heat and cold. They are fire-resisting. Hot coals thrown on them do not set fire to the roofing or to the sheathing beneath.

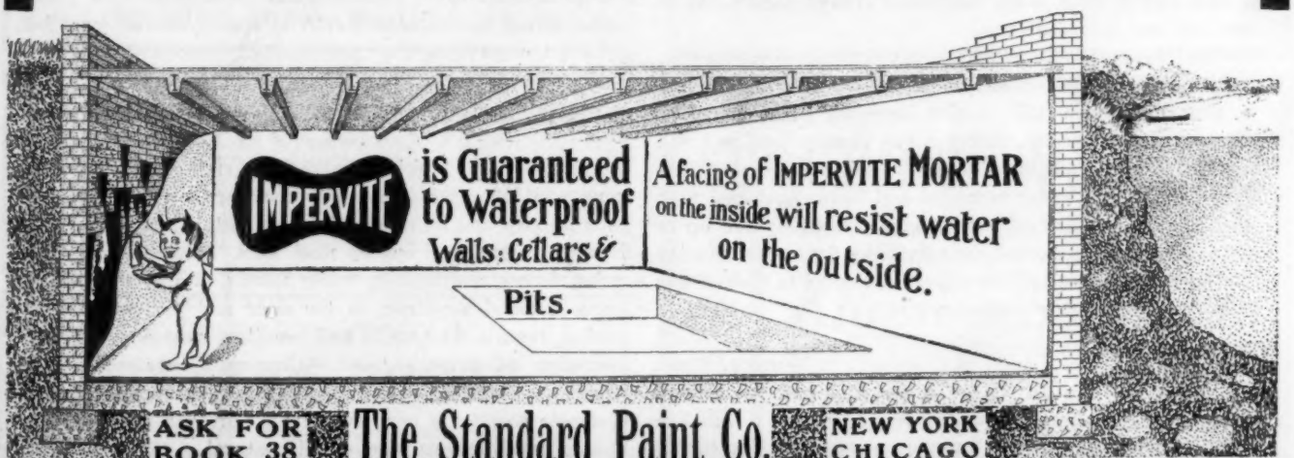
Roofings of Metal, Slate, Tile, etc., have no advantage over RU-BER-OID and KA-LOR-OID in insurance rating. All are placed in the same class by fire underwriters.

RU-BER-OID and KA-LOR-OID (Colored Ruberoid) are inexpensive to buy, cost little to lay and require very little attention. They are in the end the cheapest roofings known.

Booklet containing a lot of roofing information and interesting comparisons of various classes of roofings will be mailed on request.

The Standard Paint Company

The Standard for Two Generations


IMPERVITE
is Guaranteed to Waterproof Walls: Cellars & Pits.
A facing of IMPERVITE MORTAR on the inside will resist water on the outside.

ASK FOR BOOK 38 — The Standard Paint Co. — NEW YORK CHICAGO

procured by the evaporation of the water in contact with the air as it passes through the humidifier, and this cooling effect on warm days runs anywhere from 12 to 20 degrees below the outside temperature. The air leaves the humidifier at 100 per cent humidity, and its temperature is allowed to rise in the mill so that the humidity is reduced to that required. By this arrangement mills on hot days carrying a reasonable humidity are cooled from 8 to 15 degrees below that of the outside temperature, making it very much more livable for the operatives and making conditions very much better for the manipulation of the fibers.

The fan which is used for supplying the air to the building and the centrifugal pump which is used for circulating the water could be either steam, belt or electric-driven. The cost of the power consumed is small as compared to the increased revenue due to increased production.

The entire apparatus is automatically controlled so as to maintain a uniform temperature throughout the winter and a uniform humidity throughout the year. Classifying the advantages of such a system, we have:

(1) Cooling of mills in summer, holding temperatures down, thereby enabling humidity to be maintained, giving an increased production in summer as well as winter.

(2) The maintaining of a constant temperature and humidity, thus enabling the work to be done with fewer adjustments and fewer broken ends.

(3) The procuring of humidity and cooling by means of a very small amount of water which is evaporated.

(4) A humidifying system without any water being conveyed into the mill which could in any way rust or affect the machinery.

MASON MACHINE WORKS.

The Mason Machine Works, of Taunton, have completed negotiations with the Henry A. Wise-Wood Company, of New York, to build all their printing presses for the next ten years. This means that between two and three hundred additional hands will be employed. The same company are also to build all the machines for the next three years for the Autoplate Company of America. These contracts, of course, involve several million dollars.

Although the Mason Machine Works are well known as builders of cotton mill machinery, the fact that they undertake the building of other kinds of machinery is no new departure for them, since they have always done more or less business in those lines.

The Mason Machine Works are to be congratulated on their enterprise and success in having secured business in another line which will require increased plant facilities. The principal business, however, has always been and will always be the building of cotton mill machinery. Their shops are larger, better arranged and better equipped than ever for the building of such machinery. They are up to date in every respect, and their facilities for manufacturing and handling cotton mill machinery are equal to that of any similar concern in the country.

The DARY RING TRAVELER COMPANY, of Taunton, Mass., has opened a Southern branch in the Mills building, Greenville, S. C. H. Collaway Mims is in charge. A full line of Dary ring travelers is carried in stock at this Southern office.

"RESULTS COUNT."

The following terse paragraphs were contributed by Ed. Herrlinger to *Yarns*, the house organ published by the AMERICAN MFG. CO., Brooklyn, N. Y.:

"We pay for results, not explanations. If half the ideas wasted on excuses were properly applied, progress would be three centuries further down the pike.

"Measure your work with a speedometer, not a clock. We don't care how long you took; we want to know how far you went.

"The man who climbs over your head was stronger than you—don't envy, but imitate him. 'Good luck' is just a lazy man's estimate of a fighter's success.

"The man who loafs on his job soon discovers that every day in the year is Friday the 13th.

"When our enemies cease to cuss us, we'll start to worry. The yell of a competitor is the bell back of the bull's-eye—it only sounds when we hit where we aim.

"It costs us just as much per hour when you worry as when you work—we make our profit out of the work. Worry, and you'll create a cause for it.

"The man who remembers his last employer's secrets has too good a memory to be entrusted with ours.

"We judge men by the creases in their brains, not by the creases in their pants. Your tailor can't cut rungs for our ladder.

"I don't believe in spiritualism, but if you try to bury a mistake you'll find that we're good enough mediums to materialize its ghost.

"Ask more questions and we'll ask less. When you cease to come for advice, we'll begin to think that you need it."

SPRING IS HERE.

Spring is not an insignificant thing in astronomical mathematics. For instance, the earth has to swing around in its orbit 560,000,000 miles to reach from one spring to the next spring. Other brother planets in our solar system have to swing around an even larger orbit than our earth to reach their spring. The next planet to the earth—that is, Mars—swings around in 687 days, nearly a thousand million miles from one spring to another, while Neptune swings around over 18,000,000,000 miles from one Neptunic spring to the next Neptunic spring, which must be quite an event with the Neptunians. Therefore, mathematically speaking, spring is a ponderously important matter, and not merely an "ethereal mildness" of do-nothing and dream, as one noted poet puts it.

The winter of biting melancholy and chafing ice has gone and left its injuries only too apparent. No season puts its grip and its bite harder into metal than the winter. Bridges, signal apparatus, steel cars, smokestacks, iron poles, fences, gas holders, water towers, and every kind of exposed metal structure, in the clear and pitiless light of spring, reveals the terrific and merciless wear and bite and corrosion of winter's tooth. Corrosion, unattended to, soon means a loss of strength; a structure beyond repair; a double cost for a new structure. Spring repainting is a spring resolution, as wise as it is natural.

Perhaps one of the best known and best made protec-

GLENLYON DYE WORKS

(Yarn Dept.)

CENTRAL FALLS, R. I.

FRANK A. SAYLES, Lessee

Blaechers and Dyers

OF

Cotton Yarns in Bal-warps and Skeins, Silk and Viscose Silk

SPECIALTIES: COLORS FAST TO BLEACHING, Mercerizing, Laundering, Cross Dyeing and Light. Dyed Novelty Effects in Fast Colors. High Grade Bleaching of Cotton Warps and Skeins. Silk Dyed Fast to Boiling Off and Bleaching.

Insist on Having

"GLENLYON DYED YARNS"

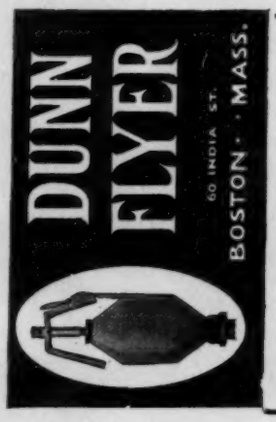
Safest and Most Reliable in the Market.

Write for Shade Card, Information and Guarantee.

are adapted to any style or size of building from workmen's cottages to the finest residences. They are easily and quickly laid, right over wooden shingles if desired.

Let us send you the names of nearby users of Cortright Metal Shingles. No obligation. Write today.

CORTRIGHT METAL ROOFING COMPANY
Philadelphia and Chicago.



PERFECT BALANCE.
NO CHANGING SLOT.
TWIST RETAINED.
A " DOG DAY" FLYER

MORE AND BETTER ROVING

LESS DOFFING, HANDLING, SETTING IN, PIECINGS AND WASTE.

Costs No More
Makes and Saves You Money.

DUNN FLYER CO.
60 India St., Boston, Mass.

The "1912" Cloth Cutting, Folding and Winding Machine

This machine will cut down operating expenses. It does in one operation the work which is now being done in two. It cuts the cloth, folds the edges and rolls them up in one operation, and at all times gets one more strip out of a bolt of cloth than is possible with the old method of cutting. At the same time it measures the bolt of cloth to show the manufacturer whether or not he is getting the number of yards he is paying for. With the high price of cotton to-day every knit goods manufacturer ought to look into this to see if he is getting the maximum efficiency at the least expense. You will find when you come to figure it up in the course of a year that the labor it saves is a big item.

Also have other labor-saving devices, and upon application you can get prices and full information on same.

J. A. FIRSCHING, 50 John St., Utica, N.Y., U.S.A.

Clinton H. Scovell & Company

Certified Public Accountants
Industrial Engineers

40 Central Street, - - Boston, Mass.

Specialists in Textile Cost Accounting

PUX—The Softener of Merit

If you have never tried Pux Softener, you have overlooked the one softener that **always** gives entire satisfaction and perfect results. It leaves a fine, heavy finish and clothy feeling, a beautiful silk lustre, and at the same time gives the goods a soft and mellow feel.

Try It—Just Once

STANDARD SOAP CO., - - Camden, N. J.

FOR

SCOURING—WASHING

There is nothing which gives you the soft, harmless, thorough and low-priced results of

Alumina Soapalite

THE MINERAL SOAP

The Electric Smelting & Aluminum Co.
LOCKPORT, N. Y. Sole Manufacturers

A COMPLETE CATALOG

TEXTILE BOOKS

will be mailed on request.

W. R. C. Smith Publishing Co., Atlanta, Ga.

tive paints for steel is Dixon's Silica-Graphite. It has been used for many years as a construction and maintenance paint for all steel work by many of the leading railroads and industrial plants of this country and abroad. Dixon's Silica-Graphite Paint is made in only one quality—the best. Made in Jersey City, N. J.—*Graphite.*

A UNIQUE CARPET ELEVATOR.

In one of the mills which make Philadelphia famous for the making of carpets, the LINK-BELT COMPANY, of that city, recently installed a combined elevator and lowerer of unusual construction.

The problem was to provide a machine to serve six floors of a factory and permit rolls of carpets or rugs to be loaded on at any floor and discharged at any other floor either going up or going down. Fig. 1 shows the roll carried in a steel tray hung between two steel Link-Belts, the pan of the tray being pivoted and supported in such a way that on coming in contact with a lever controlled from the outside of the casing the pan tips, discharges its load, and

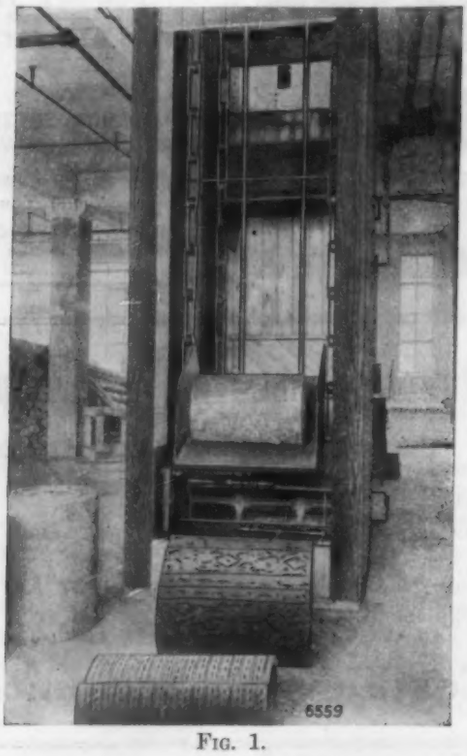


FIG. 1.

then rights itself, ready to take a new load. The trays are arranged in pairs, one to dump on the going-up side, the other to dump on the going-down side. Between each pair there is room to take a roll up on end (see Fig. 2), and at floors where rugs are discharged roller skids are arranged to receive them. The machine is 75 feet high, has a capacity of 4 rolls per minute, and is driven by a 5 horsepower motor.

Elevating and conveying machinery has long since demonstrated its efficiency and economy in the handling of raw and finished products. Better results would often be obtained today in factories and mills throughout the country if engineering brains were called upon more often to solve the high-cost-of-handling-materials problem.

THE BIRMINGHAM AGE-HERALD.

The *Age-Herald*, of Birmingham, Ala., has entered on the present year better known and more generally recognized as one of the nation's leading newspapers than ever before. Added to the seven-day service of the Associated Press in presenting the news, this paper is constantly increasing its special magazine features and social service department. It is one of the best balanced newspapers published south of the Ohio. Birmingham and Alabama should be and no doubt are proud of it.

Arabol Gum G, one of the staples of THE ARABOL MFG. CO., 100 William St., New York City, when used in its pure state gives excellent results in light and heavy sizing of cotton warps and is especially recommended by its manufacturers for use on export goods, such as China shirtings, drills, denims, coarse or medium goods, etc. Mixed with starch, it gives it volume and adhesive power and adds elasticity and tensile strength.

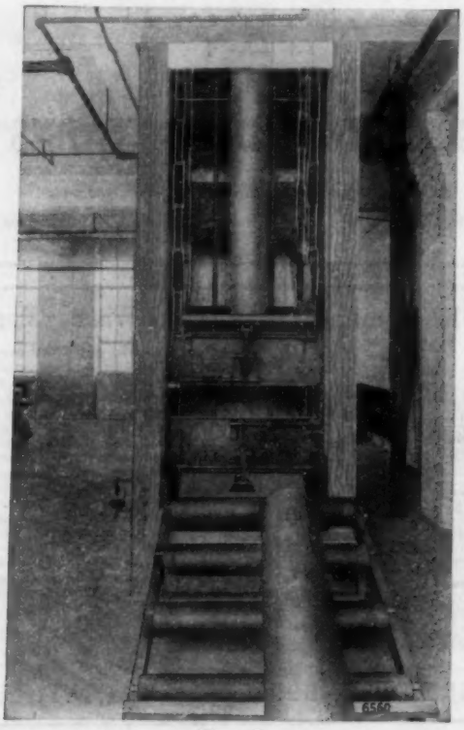


FIG. 2.

Albert W. Thompson, the inventor of the Turbo humidifier, has become actively identified with the G. M. PARKS COMPANY, of Fitchburg, Mass. Mr. Thompson will act in the engineering department, which is becoming more and more a factor in this company's work, and his shop and particularly his textile experience, will make his engineering knowledge particularly valuable to the client. He was graduated from the Massachusetts Institute of Technology in the class of 1896. He joined the staff of the Amoskeag Company, rising by merit to the office of mechanical superintendent, having in charge the machine shop and machine problems about the mill. Later he became superintendent of the Saco-Lowell shops at Lowell and he goes from there to the staff of the G. M. Parks Company.

CLINCHFIELD COAL
The firm foundation upon which is built—
SUCCESSFUL MANUFACTURE
Its high calorific value and superb firing qualities give the maximum boiler capacity and fuel economy.
Mined by
THE CLINCHFIELD COAL CORPORATION
DANTE VIRGINIA
Sold by
THE CLINCHFIELD FUEL COMPANY
SPARTANBURG S.C.

BOOK REVIEWS

All Books Reviewed Under This Heading May Be Procured From COTTON at the Published Price.

AMERICAN TEXTILE DIRECTORY AND YARN TRADE INDEX FOR 1914. (*The Green Book*). 634 pages. Published by the Lord & Nagle Co., 144 Congress St., Boston, Mass. Price, office edition, $3.00. Travelers' edition, $2.00. Vest-Pocket edition, per section, $1.00.

This well-known directory, which usually makes its appearance some time in July, has again made an early appearance this year. It contains a full list of the textile establishments of the United States and Canada, about 7,000 in all, arranged by states and towns where they are located with full data about each mill. The yarn trade index is a very complete one, as are also the indexes of yarn dealers, commission merchants and agents; bleaching, dyeing, and printing establishments; dealers in raw material; manufacturers' selling agents; dry goods commission houses, etc. There is also a classified list of mills according to the goods made, which is a very convenient index to have at hand on certain occasions. The textile associations of the United States and Canada are given, with the names of the officers and their addresses. As a whole, it is a valuable work of reference which finds a useful place on the desk of every manufacturer.

Dyers of cotton yarn will be much interested in a new volume on the use of Hydron colors for that particular class of work which has just been issued by the CASSELLA COLOR COMPANY, New York. In view of the continually growing interest on the part of manufacturers of cotton goods as well as professional dyers, this interesting volume appears at a most opportune time. The volume is illustrated with a series of 122 dyeings, showing an extremely wide range of shades obtained by the use of Hydron colors. It shows not only a series of dyes of self shades, but also in combination with each other for the production of compound and mode shades. The descriptive matter is included within fourteen pages and gives complete technical details of the various methods on the dyeing of Hydron colors. The description of the various dyeing processes omits no details as to the proper working, thus placing the dyer in a favorable position to grasp the simple details for applying this interesting group of colors; nothing appears to have been omitted that could leave any doubt in the mind of the workman.

Of particular interest to dyers of mode shades at this time is a series of khaki shades produced with the Hydron colors, and which would seem to offer a possibility for a wide field of usefulness.

A copy of this volume should be a valuable and useful addition to the library of the practical dyer, and we might add that designers of cotton fabrics calling for the use of fast colors will also find it of value. The Cassella Color Company will no doubt be glad to supply, upon request, a copy of this work to dyers or manufacturers of cotton fabrics.

THE BAYER COMPANY, INC., 117 Hudson St., New York City, are forwarding to the trade the following color cards, which not only contain samples of material dyed with the color described, but also full directions for dyeing and the special properties claimed for the dyestuffs in question: Alizarine Indigo 7 G paste; Alizarine Indigo Red B paste; Acid Anthracene Red 3 B L; Alizarine Dyamine Green E F; Acid Chromo Violet R; Algole Yellow W F paste; Katigen Red Brown R K; Diazo Fast Scarlet B L; Benzo Pure Yellow F F; Benzo Fast Scarlet B S S and 6 B S S; Benzo Bronze E; Acid Anthracene Red 2 B L, and Acid Anthracene Red 5 B D. Copies of these color cards can no doubt be secured upon application to the Bayer Company.

MILL NEWS

Notices of mill projects, additions or improvements are solicited for this department. Other notices pertaining particularly to the Southeastern section will be found in the Southern Mill Situation review.

ILLINOIS.

CHICAGO. The Kinlock Hosiery Mills have been incorporated with a capital stock of $10,000. The incorporators are M. H. Forner, John A. Mausen, and W. H. Lunesch.

MASSACHUSETTS.

FALL RIVER. The Lincoln Mfg. Co. has recently ordered 250 new looms to be installed in the No. 2 mill. Preparatory machinery and spinning equipment to accompany these looms is already in place and use.

NORTH HAMPTON. The North Hampton Hosiery Co., which was incorporated several months ago with a capital stock of $10,000, has started operation. The products are to be cotton and silk seamless hosiery.

MICHIGAN.

BAY CITY. The Amonica Knitting Mills, manufacturers of miscellaneous knitted goods, are to move their plant to Williamston, Mich., and consolidate with the New Way Knitting Co., manufacturing sweater coats, etc.

NEW HAMPSHIRE.

NASHUA. Work is progressing rapidly on the additions started last fall at the north end of the main mill of the Nashua Mfg. Co., and it is expected that the factory will be completed shortly. This addition measures approximately 100 x 150 feet, five stories high. The building will allow for the installation of 30,000 additional spindles and the accompanying preparatory machinery.

NEW YORK.

LITTLE FALLS. The Phoenix Underwear Company is consolidating its power plant at the west group of mills and is not making any addition in the way of equipment or construction as has been erroneously reported.

OSWEGO. It is locally reported that the plant of the Ontario Knitting Co., is to be taken over and new machinery installed and operated as a yarn mill. This plant has been idle since 1909.

UTICA. The Oneida-Regal Textile Co., the Ontario Knitting Co., and the Utica Button & Box Company are to be consolidated with the Frisbie & Stansfield Knitting Co. For the purpose of acquiring these three new concerns, the reorganized Frisbie & Stansfield Co. will issue $1,000,000 first mortgage six per cent bonds and will increase its common and preferred stock to an amount not yet determined. The Frisbie & Stansfield Co., with the completion of the work of absorbing the companies mentioned, will have two knitting mills and a button and box factory in Utica, a hosiery mill in Syracuse, and underwear and hosiery mills in Camden, N. Y., Oswego, N. Y., Ontario and Waterville, N. Y., and a hosiery mill in Philadelphia.

PENNSYLVANIA.

PHILADELPHIA. The Federal Knitting Co., Inc., manufacturing knit goods, has been incorporated with a capital stock of $20,000. Samuel S. Cridmore, George H. Schofield and Hubert A. Payne, of Philadelphia, are the incorporators.

SELLERSVILLE. Cammer & Gottswal have bought the hosiery mill on Green Street, formely operated by M. Bergey.